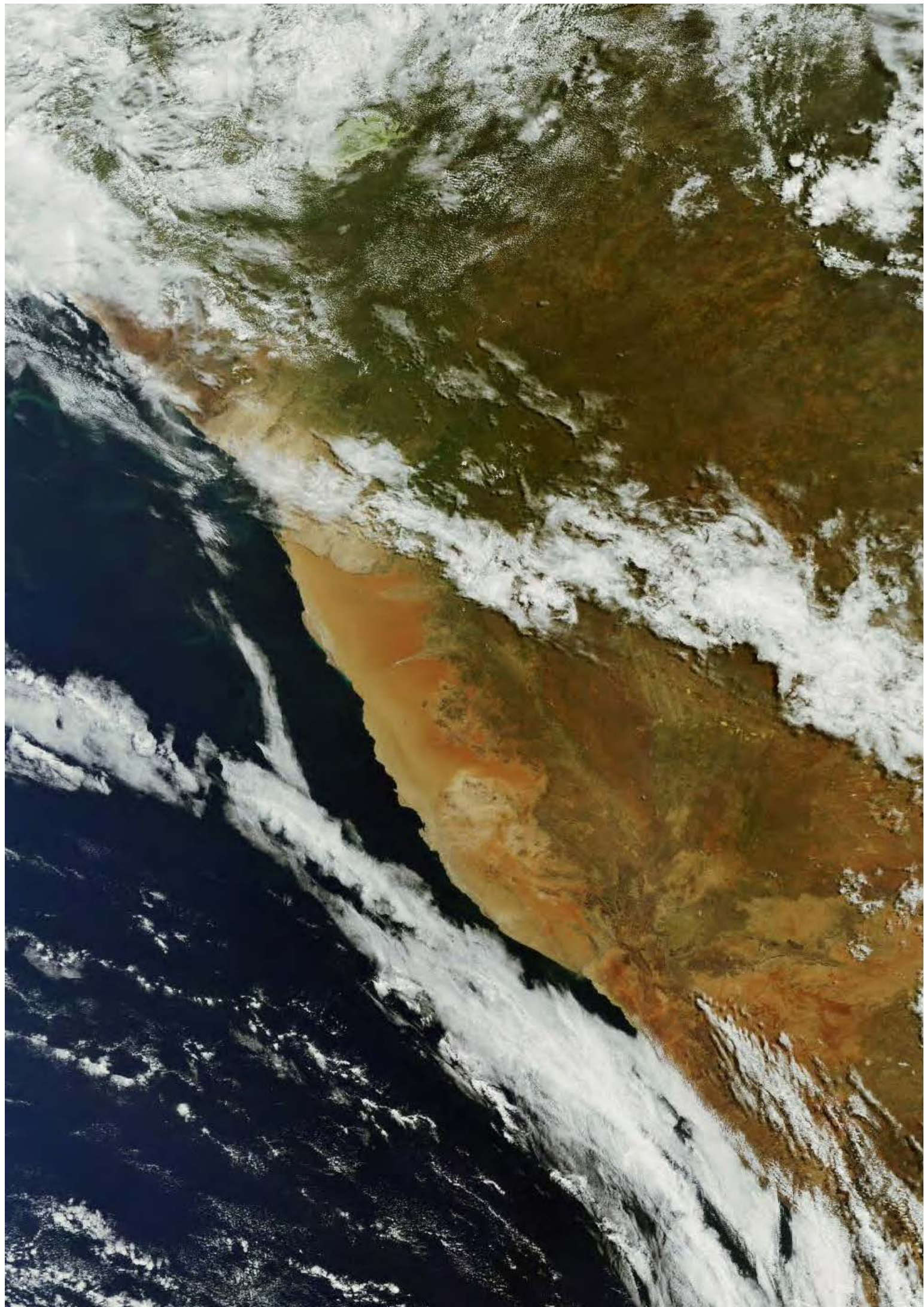


An aerial photograph of the Namib Sand Sea coastline. The image shows a vast expanse of golden sand dunes in the foreground and middle ground, sloping down towards a dark blue ocean. A narrow strip of beach and a lagoon are visible between the dunes and the sea. The sky is a clear, pale blue. The overall scene is a striking contrast of desert and coastal environments.

Namib Sand Sea

World Heritage Nomination



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**Nomination dossier to UNESCO for inscription
into the World Heritage List**

2012

Namibia National Committee for World Heritage

© Republic of Namibia, January 2012.

Published by:

Namibia National Committee for World Heritage
Namibia National Commission for UNESCO, Ministry of Education
Private Bag 13186, Windhoek, Namibia.

Namib Sand Sea World Heritage Nomination. Seely, Mary
(Editor). 2012. Namibia National Committee for World Heritage.
Windhoek.

ISBN 978-99945-0-035-2

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associated photographers) unless noted.

Front cover image:

Endless sand supply from the South Atlantic to the Namib Sand
Sea at Sandwich Harbour (Paul van Schalkwyk)

Inside front cover image:

The Namib Sand Sea from space (NASA Johnson Space Center
<http://eol.jsc.nasa.gov>)

Back cover image:

An aerial view does not do justice to the magnificent dunes at
Sossus Vlei (Paul van Schalkwyk)





ACKNOWLEDGEMENTS

Riana Kadimba, Mathias Moyo, Rufina Kela Shifa and Pinehas Uupindi, interns with the Desert Research Foundation of Namibia, developed the first drafts of the description of the nominated Property. To give them a good start, Chris Brown, Eugene Marais and Roger Swart provided them with an overview of the issues from their specific perspectives.

Mark Boorman, Peter Bridgeford, Andrew Goudie, Inge Henschel, John Irish, Herta Kolberg, Holger Kolberg, Manie le Roux, Ian Livingstone, Roy Miller, Nils Odendaal, John Pallett, Carole Roberts, Gabi Schneider, Ute Schreiber, Ann and Mike Scott, Penda Shimali, Colgar Sikopo and Theo Wassenaar provided specific descriptions, information, data or considered opinions on problematic issues as they arose.

Official support for compilation of the dossier was provided by the Namibia National Committee for World Heritage, specifically Trudie Amulungu, Frieda Kanime, Eugene Marais, Esther Moombolah-/Goâgoses, Gabi Schneider and Peingeondjabi Shipoh.

The massive task of assembling and summarising the information required for this dossier would not have been possible in such a short space of time without the financial support of the German World Heritage Foundation and the mediation of the German Commission for UNESCO that facilitated the request from the Namibia National Commission for UNESCO.

William Bowen, Eckart Demasius, Julian Fennessy, the Gobabeb Training & Research Centre, Christine Marais, Tony Robertson and Paul van Schalkwyk generously contributed images and illustrations for this nomination dossier.

Stephanie Fennessy, Jack Kambatuku, Eugene Marais, Sharon Montgomery and Mary Seely were responsible for writing, final editing and assembling of some of the particularly hard-to-get materials.

All of the above, and others we may have inadvertently overlooked, are sincerely thanked for their valuable contributions.



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ACRONYMS AND ABBREVIATIONS

BP	Before Present
CBD	UN Convention on Biological Diversity
CBNRM	Community Based Natural Resource Management
CETN	Coastal Environmental Trust of Namibia
CSIRO	Council for Scientific and Industrial Research Organisation, Australia
EIA	Environmental Impact Assessment
EPLs	Exclusive Prospecting Licences
EMP	Environmental Mangement Plan
GDP	Gross Domestic Product
GIS	Geographic Information System
GLF	Global Land-cover Facility
GTRC	Gobabeb Training and Research Centre
ICZM	Integrated Coastal Zone Management
IBA	Important Bird Area
IPA	Important Plant Area
MAB	Man and the Biosphere Reserve
MAWF	Ministry of Agriculture, Water & Forestry
MAWRD	Ministry of Agriculture, Water and Rural Development
MET	Ministry of Environment and Tourism
MoF	Ministry of Finance
MFMR	Ministry of Fisheries and Marine Resources
MLR	Ministry of Lands and Resettlement
MME	Ministry of Mines and Energy
MPA	Marine Protected Area
MRLGHRD	Ministry of Regional and Local Government, Housing and Rural Development
MTI	Ministry of Trade and Industry
MWTC	Ministry of Works, Transport and Communication
MYNSSC	Ministry of Youth, National Service, Sport and Culture
NACOMA	Namibian Coast Conservation and Management Project
NatMIRC	National Marine Information and Research Centre
NBSAP	Namibia's Biodiversity Strategy and Action Plan
NDP	National Development Plan
NNP	Namib-Naukluft Park
NPC	National Planning Commission
NTB	Namibia Tourism Board
NWR	Namibia Wildlife Resorts
OUV	Outstanding Universal Value
PoN	Polytechnic of Namibia
RDP	Regional Development Plan
SEA	Strategic Environmental Assessment
UNAM	University of Namibia
WH	World Heritage



INTRODUCTION

The Namib Sand Sea represents a well-conserved, key facet of the long but narrow coastal Namib Desert of western southern Africa. It offers a stunning landscape derived from a combination of geological, geomorphic and climatological processes in which a unique biota has evolved to take advantage of fog as a moisture source and wind-blown sand and detritus as life support media.

As the iconic heart of the Namib Desert, the Namib Sand Sea has been identified for nomination as a World Heritage Site based on all four natural criteria. Although the entire Namib Desert, extending over 2,000 km from South Africa through Namibia to south-western Angola, exemplifies elements of the natural criteria worthy of inscription, their integrity and management are not all as well developed as that of the Namib Sand Sea. As the management situation evolves, it is intended that serial additions to the Namib Sand Sea will be considered for inclusion as part of the World Heritage Site.

The contiguous Namib Sand Sea itself is more extensive than the area currently proposed for inclusion in the site. The identified site is considered to be essentially pristine dune-scapes, entirely encompassed within the Namib-Naukluft Park under the management of the Ministry of Environment and Tourism. The southern extremity of the Namib-Naukluft Park and the Namib Sand Sea were excluded from the proposed Property based on the presence of active Exclusive Prospecting Licences, the fossil aquifer which supplies water to the town of Lüderitz and the intention to leave some of the area available for potentially destructive adventure dune tourism. Establishing the western border at the high-tide line ensures that a single institution (Ministry of Environment and Tourism) is responsible for management of the Property. The northern, eastern and southern borders have been identified to provide for a variable sized buffer area within the Namib-Naukluft Park.

Moreover, the Namib also has a documented history of long human occupation from earliest man as exemplified by early palaeolithic stone tools scattered along natural travel routes in the desert to vestiges of ancestors of modern Namibians that have lived in this extreme environment. These remnants include shell middens at Sandwich Harbour and Sylvia Hill, stone circles and hunting blinds mainly along dry watercourses, and stone-capped graves at Sylvia Hill. Today some Namibians still live along the Kuiseb River valley on the northern boundary of the Namib Sand Sea and retain elements of their cultural heritage that is worthy of inscription as a cultural landscape, e.g. on the basis of their !nara harvesting and use of the landscape. Unfortunately there is currently no management system in place that would allow that landscape to be considered for inscription.

The nomination for the Namib Sand Sea put forth in this dossier is considered to be a pristine dune-scape, well managed by the Ministry of Environment and Tourism, that exemplifies all four natural criteria ensuring its worthiness as a World Heritage Site. Future serial extensions will be considered as the conservation and management situation of the greater Namib Desert evolves.



An aerial photograph of a desert landscape. The scene is dominated by large, undulating sand dunes in shades of orange and tan. In the upper center, a bright blue lake is nestled within a depression. A winding, light-colored path or dry riverbed cuts through the dunes, leading towards the lake. The lighting creates deep shadows, emphasizing the contours of the sand. The overall composition is dynamic and visually striking.

Executive Summary



A water-filled vlei on the eastern edge of the Namib Sand Sea (Paul van Schalkwyk)



EXECUTIVE SUMMARY

STATE PARTY

Namibia

REGION

Erongo, Hardap and Karas Regions

NAME OF PROPERTY

Namib Sand Sea

GEOGRAPHICAL COORDINATES TO THE NEAREST SECOND

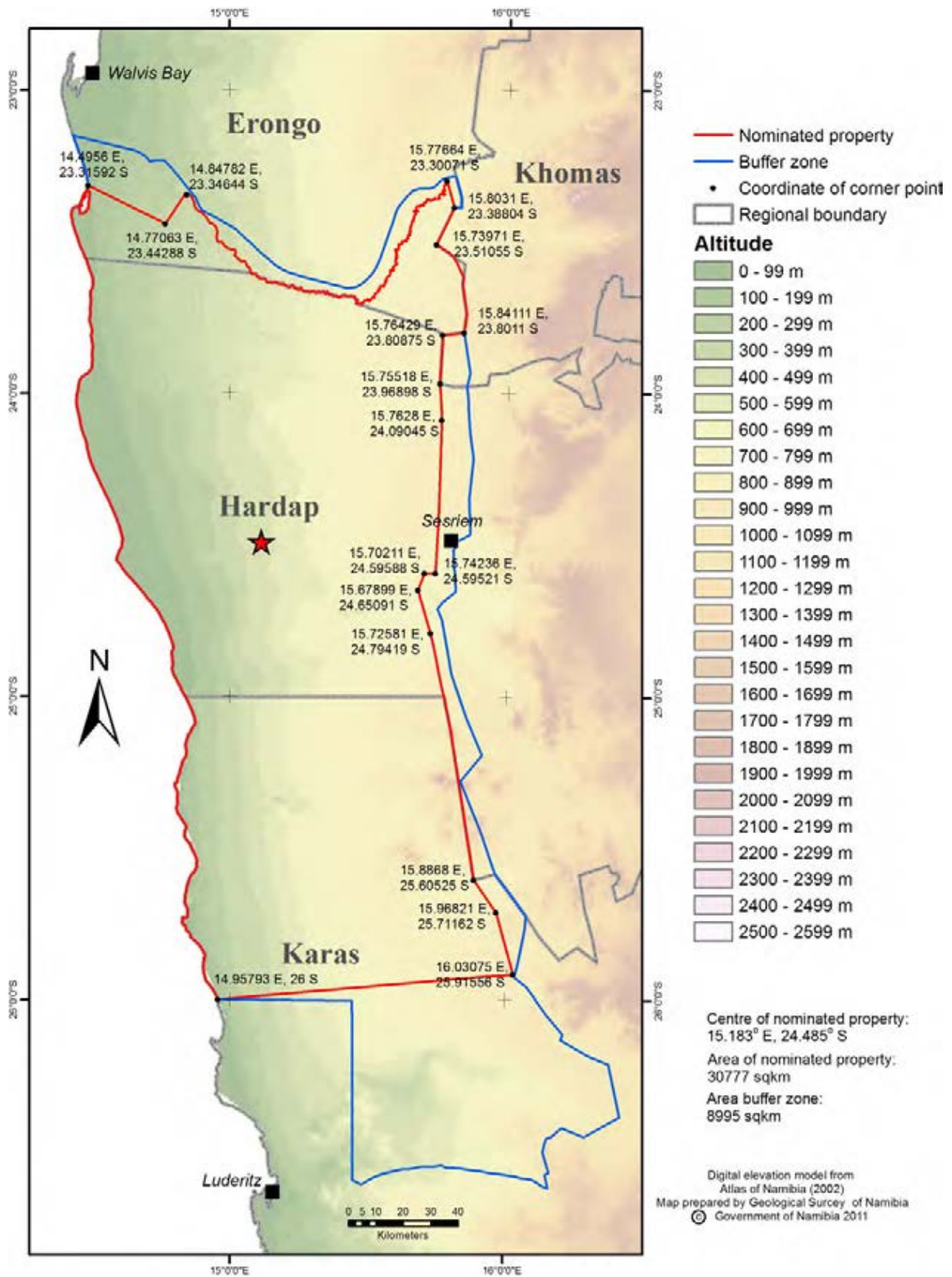
15.183° E, 24.485° S

TEXTUAL DESCRIPTION OF THE BOUNDARY OF THE NOMINATED PROPERTY

The Namib-Naukluft Park lies on the south-western coast of Africa, in Namibia, approximately 250 km south-west of the capital Windhoek. It comprises the central portion of the hyper-arid coastal Namib Desert extending from the Olifants River in South Africa, northwards along the entire coast of Namibia, up to the Carunjamba River in Angola.

The boundaries of the identified Property designated as the Namib Sand Sea lie within the Namib-Naukluft Park south of the Kuiseb River in central Namibia. Starting from Sesriem in the centre of the eastern boundary, the envisaged site boundary extends southwards to a point where the boundary of the Namib-Naukluft meets the border of farms Kanaan and Kamaland; then west-south-west to Gibraltar on the coast before following the coastline north to the Sandwich Harbour Ramsar site. The northern boundary then heads inland (eastwards) to the Kuiseb River, skirting an area earmarked for bulk water production boreholes, from where it bends along the southern bank of the dry Kuiseb riverbed before turning south, encompassing a small extent of gramadullas with incomparable vistas over the sand sea, past the Gaub River tributary to Sesriem.

LOCATION MAP OF THE NAMIB SAND SEA





JUSTIFICATION STATEMENT OF OUTSTANDING UNIVERSAL VALUE

Brief synthesis: The boundaries of the envisaged World Heritage site, entirely within the protected Namib-Naukluft Park, encompass 3,077,700 hectares from the proximate source of sand on the coast to the final area of deposition some 100 km inland. The Namib Sand Sea along the arid African coast of the South Atlantic with its superlative, diverse, spectacular array of large, striking shifting dunes is an outstanding example of the scenic, geomorphological, ecological and evolutionary consequences of wind-driven processes interacting with geology and ecology. This Namib Sand Sea is globally unique, comprising a superimposed old and a young sand sea. The sand for both was transported by river, ocean current and wind more than 1,000 km from its source in the humid interior of eastern southern Africa. Life in the fog bathed coastal dunes of the Namib Sand Sea, and the behavioural and physiological adaptations that evolved throughout its specialist communities, are significant global examples for the evolution and development of a terrestrial ecosystem community and the resilience of life in extreme environments. The high diversity (>300 species) and endemism (>50%) of the Namib Sand Sea biota are much greater than any other known hyper-arid, sand dune ecosystem. *In-situ* conservation of communities representing the turnover of endemic species from the cool coastal desert with frequent fog, to the hot, dry interior where more extreme aridity requires different strategies for survival, is ensured by the extensive, continuous habitat types across the full climatic gradient of the Namib Sand Sea.


Justification for criteria:

vii: Outstanding natural beauty of the Namib Sand Sea

The Namib Sand Sea encompasses vast panoramas of majestic dune-scapes, strikingly crystallised in sharply silhouetted forms continually transformed with wind and time. The striking range of spectacular dune forms and colours in an ongoing interplay of contrasting shadow and light, combined with diverse, fascinating and bizarre plant and animal life, bestows a superlative, distinct natural beauty and aesthetic charm.

viii: Active geological processes of global significance

The Namib Sand Sea is composed of two superimposed dune systems, one semi-consolidated as old as 21 million years, the younger unconsolidated and active for about 5 million years, neither eroded *in-situ* from the underlying substrate. Three contrasting, ongoing sedimentary 'conveyor belt systems', the fluvial transport of the Orange River, a coastal long-shore drift and coastal on-shore winds, finally deposited the palaeo and modern dune systems in the Namib Sand Sea – representing outstanding geological processes of global significance. The Namib Sand Sea presents a universally outstanding example of extraordinary aeolian landscapes relentlessly sculpted by the basal topography and pronounced daily and seasonal changes in dominant wind directions. Remarkable examples of ongoing desert geomorphic and physiographic features such as inselbergs isolated by encroaching dune fields, relict topography and sedimentary deposits from past climatic changes, endorhaeic river-end pans and exemplars of most desert geomorphic features are resplendently displayed in the Namib Sand Sea.



ix: Ongoing natural ecological dynamics that drive the evolution and interaction among Namib Sand Sea fauna and flora

The number of diverse, superbly adapted dune-inhabiting endemic species, in a hyper-arid environment with low net primary productivity, interacting through intricate food webs within a vivid environmental backdrop in the Namib Sand Sea is unique relative to all other hyper-arid desert ecosystems. The high frequency of fog towards the coast has given rise to very rare behavioural adaptations to condense and harvest fog-water in these hyper-arid conditions. In parallel, the well-oxygenated subsurface sand offers swift escape strategies from arid extremes for ‘swimming’ and ‘diving’ invertebrates, reptiles and mammals. Myriad microhabitats of the ever-mobile dunes of the Namib Sand Sea create a plethora of ecological niches for bizarre and fascinating ways of dealing with arid, adverse extremes over small and large-scale, steep climatic gradients.

x: Extraordinary diversity of endemic species of special significance to science and environmental understanding

The Namib Sand Sea imparts an unfragmented and pristine environment along a vast range of macro- and micro-climatic and habitat conditions that sustains a vast genetic diversity of species. These rich, diverse habitats are of outstanding international importance for conservation of a variety of diverse biological creatures in their natural place of evolutionary origin with confirmed, outstanding universal scientific value. The Namib Sand Sea exemplifies one of the most extensive, spectacular protected natural habitats for *in-situ* conservation of hyper-arid biological diversity in the world. More than 50% endemism, in some groups over 75%, in the more than 300 species of plants, invertebrates and vertebrates is safeguarded within the sand sea that covers 84% of the Property. Well-documented results from ongoing scientific research and long-term monitoring are readily available to explain the biodiversity, ecological relationships and fluctuations in species presence and population changes. The Namib Sand Sea is wholly protected within the borders of the Namib-Naukluft Park with its long-term management programme and allocated funding.

Statement of integrity: The Namib Sand Sea is essentially a pristine environment within the borders of the Namib-Naukluft Park. The extensive dune-scapes are unspoilt and continuously refreshed and maintained by wholly natural processes. Permanent visitor and management infrastructure is non-existent within these boundaries and temporary occupation is restricted to small, temporary point locations that have no measurable effect on the well-known and well-researched geological, geomorphological, ecological, and biological processes of the Namib Sand Sea.

Requirements for protection and management necessary to maintain potential outstanding universal value: The 100-year long history of exclusionary regulations followed by conservation management interventions has informed and is available to inform future decisions about maintaining ecosystem processes not undermined by human exploitation. The Namib Sand Sea has been under conservation management for more than 50 years with well-established management and resource allocation systems, based upon a regularly revised and updated management plans and long-term budgetary planning. Key management issues today include managing the increasing demand for visitor access to pristine areas and precluding mineral exploration rights that would impact on the values and attributes of the area.



CRITERIA UNDER WHICH PROPERTY IS NOMINATED

The Namib Sand Sea along the African coast of the South Atlantic with its superlatively large, shifting dunes is an outstanding example of the scenic, geomorphological, ecological and evolutionary consequences of wind-driven processes interacting with geology and biology.

The site meets the following **natural** criteria:

Criterion vii: contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance.

The Namib Sand Sea's majestic dunes with their cornucopia of ever-changing shapes and interplay of shadow and light, within a setting of spectacular desert scenery and vast panoramas of undulating dune-scapes, are of compelling natural beauty. This beauty is enhanced by the exceptional visibility resulting from the virtual absence of moisture, dust and atmospheric pollution in this hyper-arid climate revealing remarkable clarity of landscape features by day and the dazzling Southern Hemisphere sky at night.

Criterion viii: is an outstanding example representing major stages of earth's history, significant ongoing geological processes in the development of land forms, and significant geomorphic and physiographic features.

The Namib Desert results from the rare juxtaposition of cold boundary currents, such as the Benguella current of the South Atlantic, alongside hot continental interiors. The physical effects that the atmospheric conditions cause on ongoing accumulation and constant movement of dunes in the Namib Sand Sea is a renowned example of major geological processes that have formed dune and desert formations throughout earth's history. The physiography of the sand sea includes most known types of dunes in sandy deserts (or ergs) formed through aeolian depositional processes, including associated desert land forms such as inselbergs, pediplains and playas.

Criterion ix: is an outstanding example representing significant ongoing ecological and biological processes in the evolution and development of terrestrial ecosystems and communities of plants and animals.

Life in the dunes of the Namib Sand Sea, and the behavioural and physiological adaptations that have evolved in its specialist communities, are significant global examples of the evolution and development of a terrestrial ecosystem community and the resilience of life in extreme environments.

Criterion x: contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation.

The number (>300) and endemism (>50%) of species in the Namib Sand Sea, are much greater than any other known dune ecosystem. In-situ conservation of communities representing the turnover of endemic species from the cool coastal desert with frequent fog, to the hot, dry interior where more extreme aridity requires different strategies for survival, is ensured by the extensive, continuous habitat types across the full climatic gradient of the Namib Sand Sea.



NAME AND CONTACT INFORMATION OF OFFICIAL LOCAL INSTITUTION

Organisation: Permanent Secretary, Ministry of Environment and Tourism

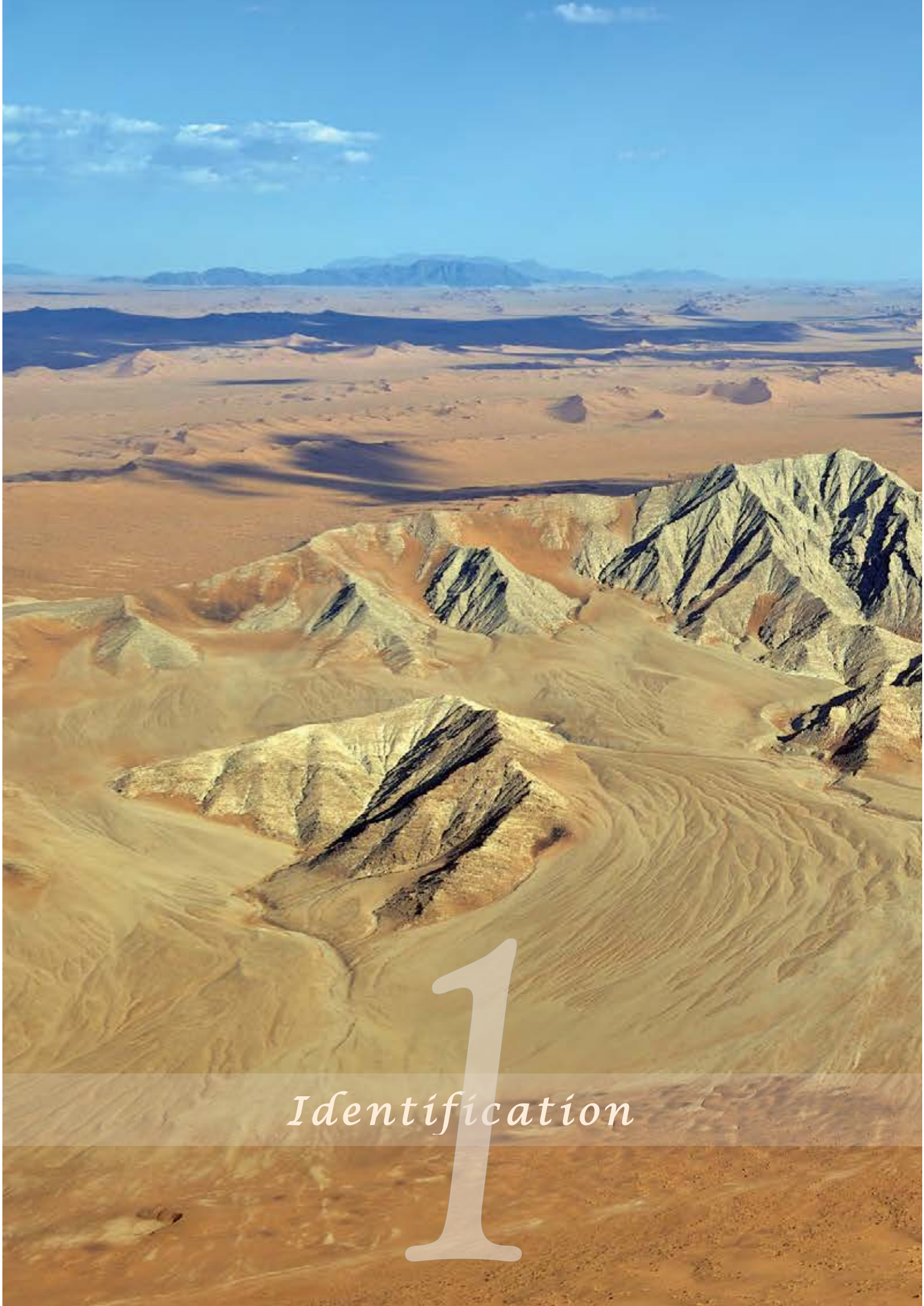
Address: Private Bag 13346, Windhoek

Tel: +264 61 284 2111

Fax: +264 61 225651

E-mail: kshangula@met.na

Web address: www.met.gov.na




1

Identificación



The Witberg is an isolated inselberg in the Namib Sand Sea (Paul van Schalkwyk)



1

Identification of the Property

1.a COUNTRY

Namibia

1.b REGIONS

Erongo, Hardap and Karas Regions

1.c NAME OF PROPERTY

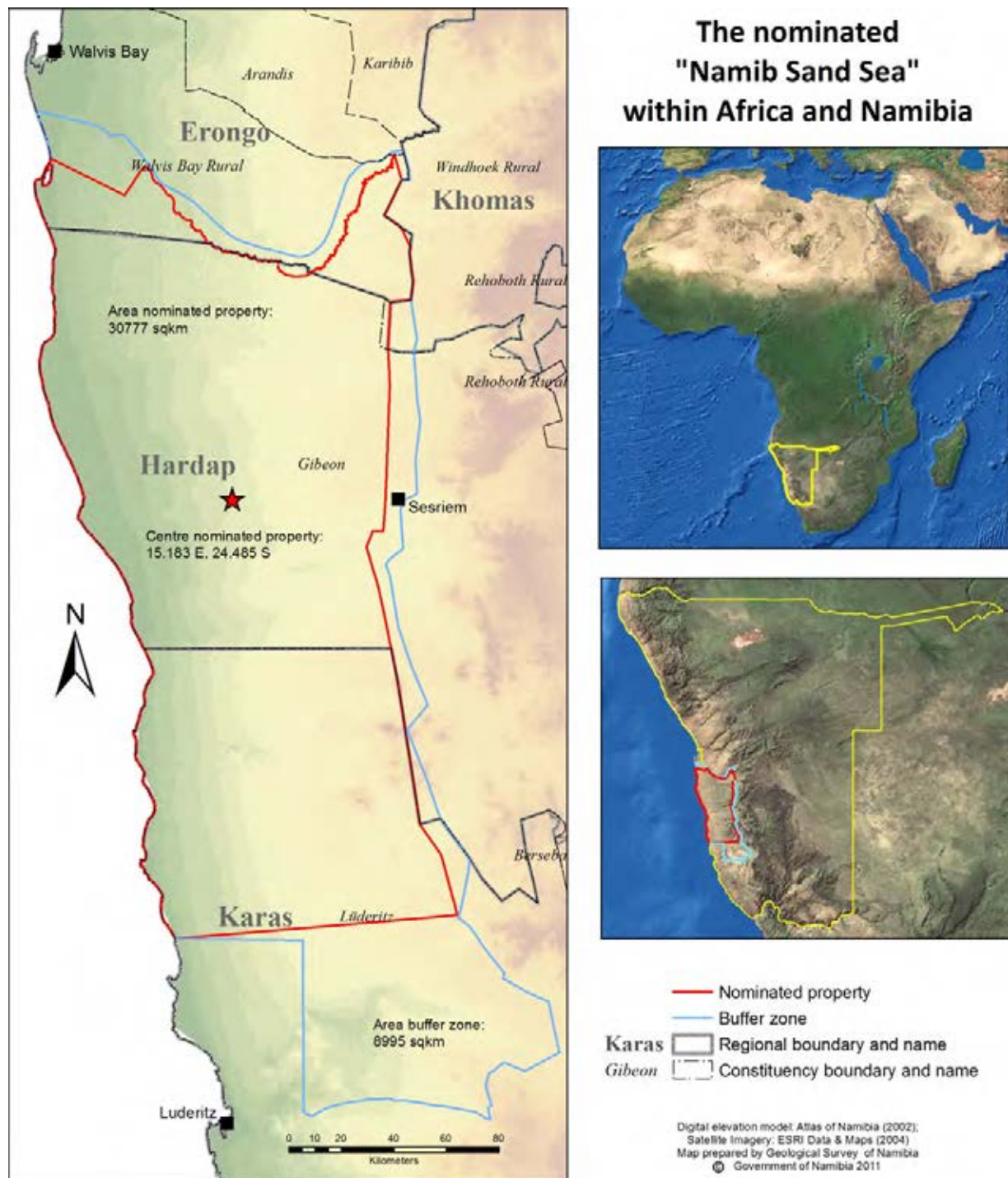
Namib Sand Sea

1.d GEOGRAPHICAL COORDINATES

15.183° E, 24.485° S

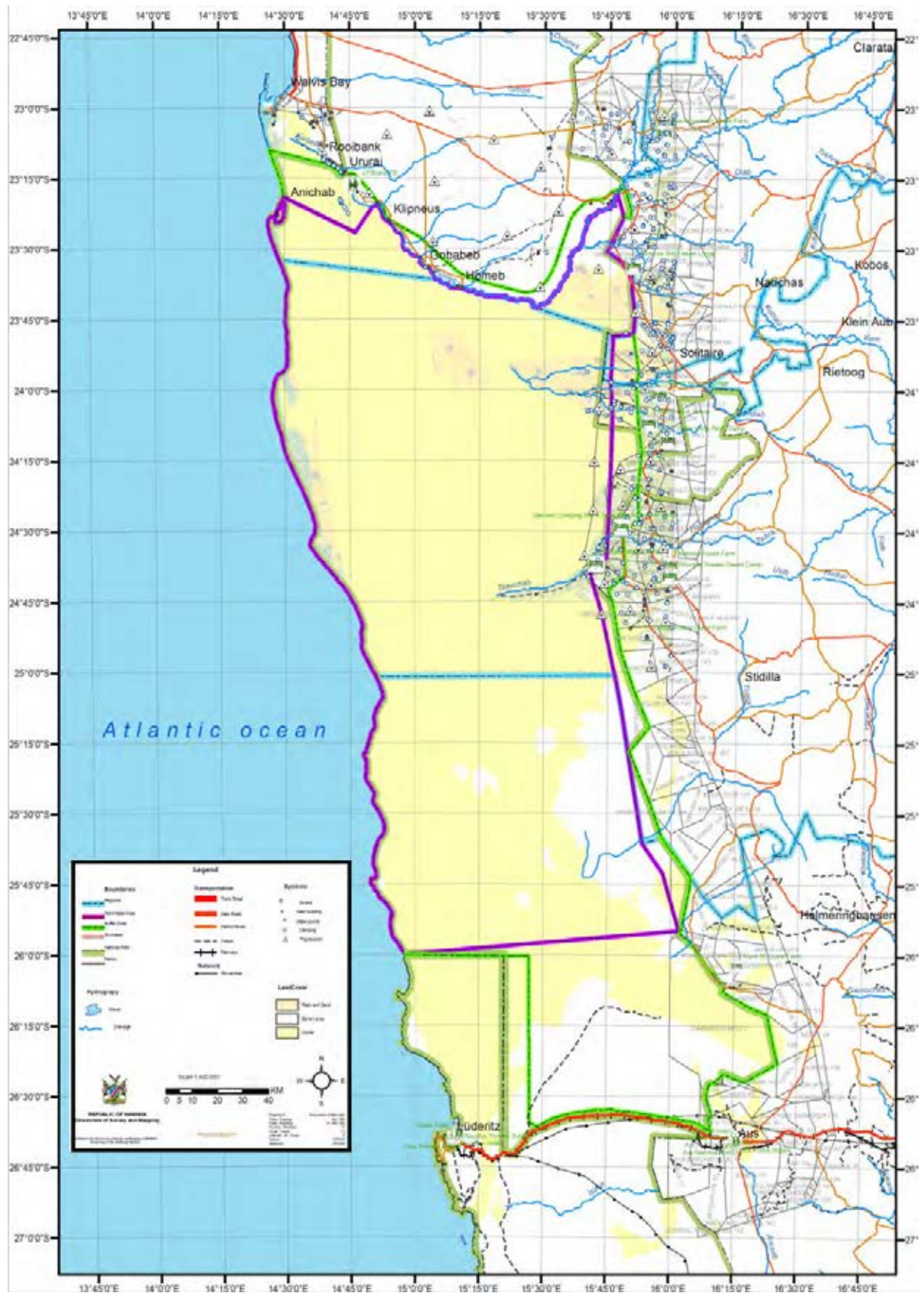
1.e MAPS AND PLANS, SHOWING THE BOUNDARIES OF THE NOMINATED PROPERTY AND BUFFER ZONE (see Annex 2)

Map 1.e.1: Location of the Namib Sand Sea in Namibia and the African continent

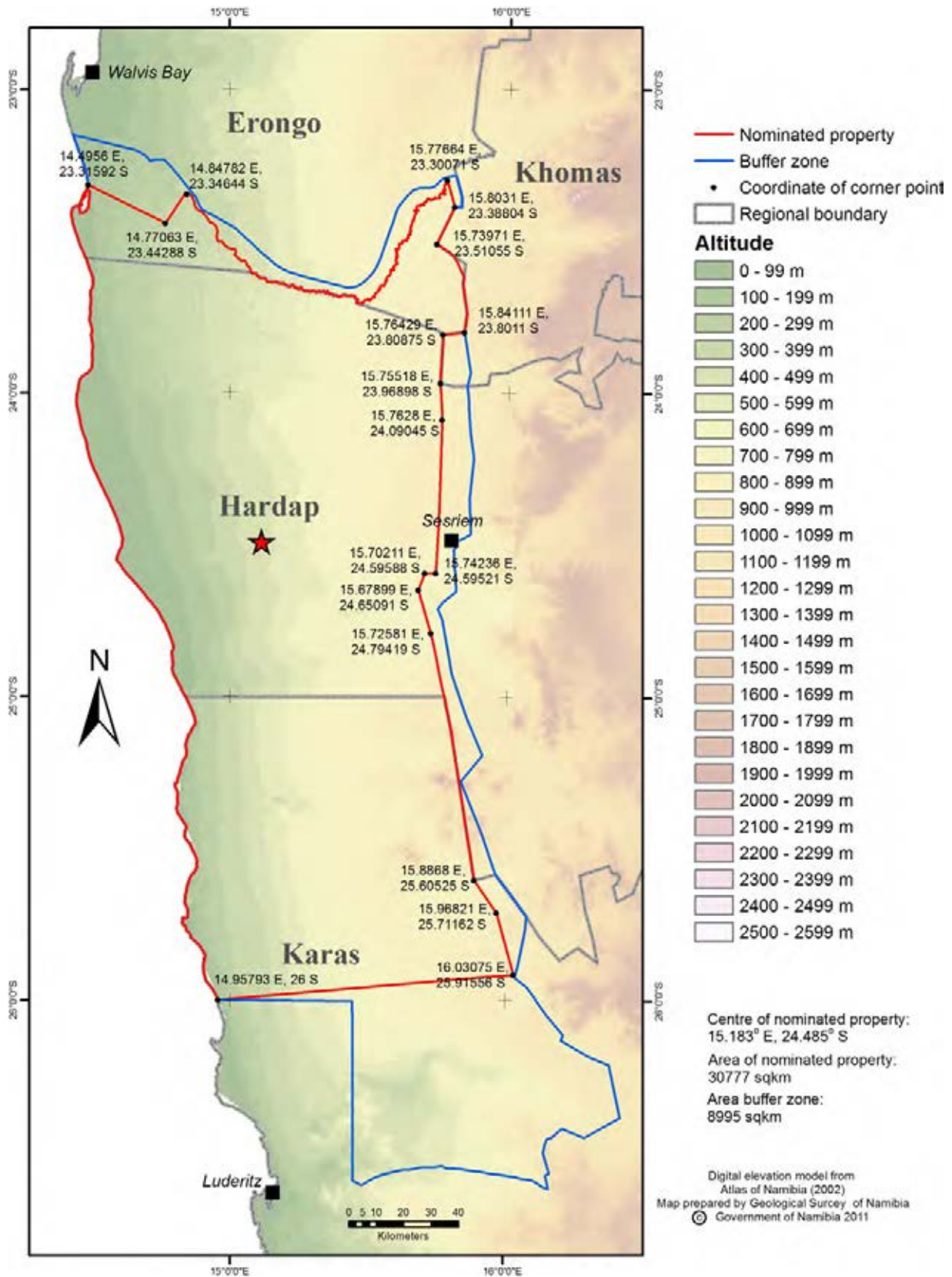




Map 1.e.2: Boundaries of the Namib Sand Sea and Buffer Zone.

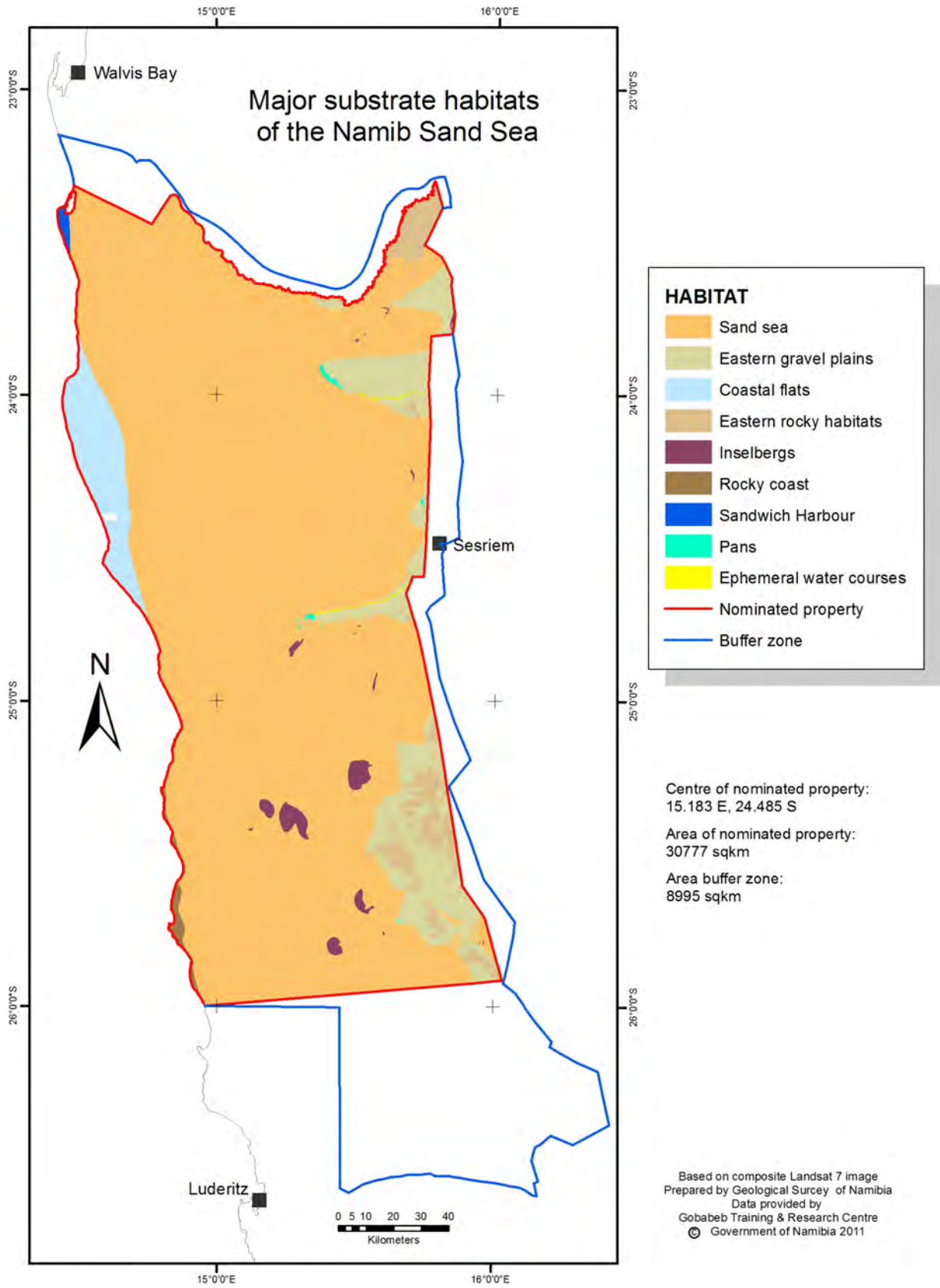


Map 1.e.3: Boundary coordinates of the Namib Sand Sea

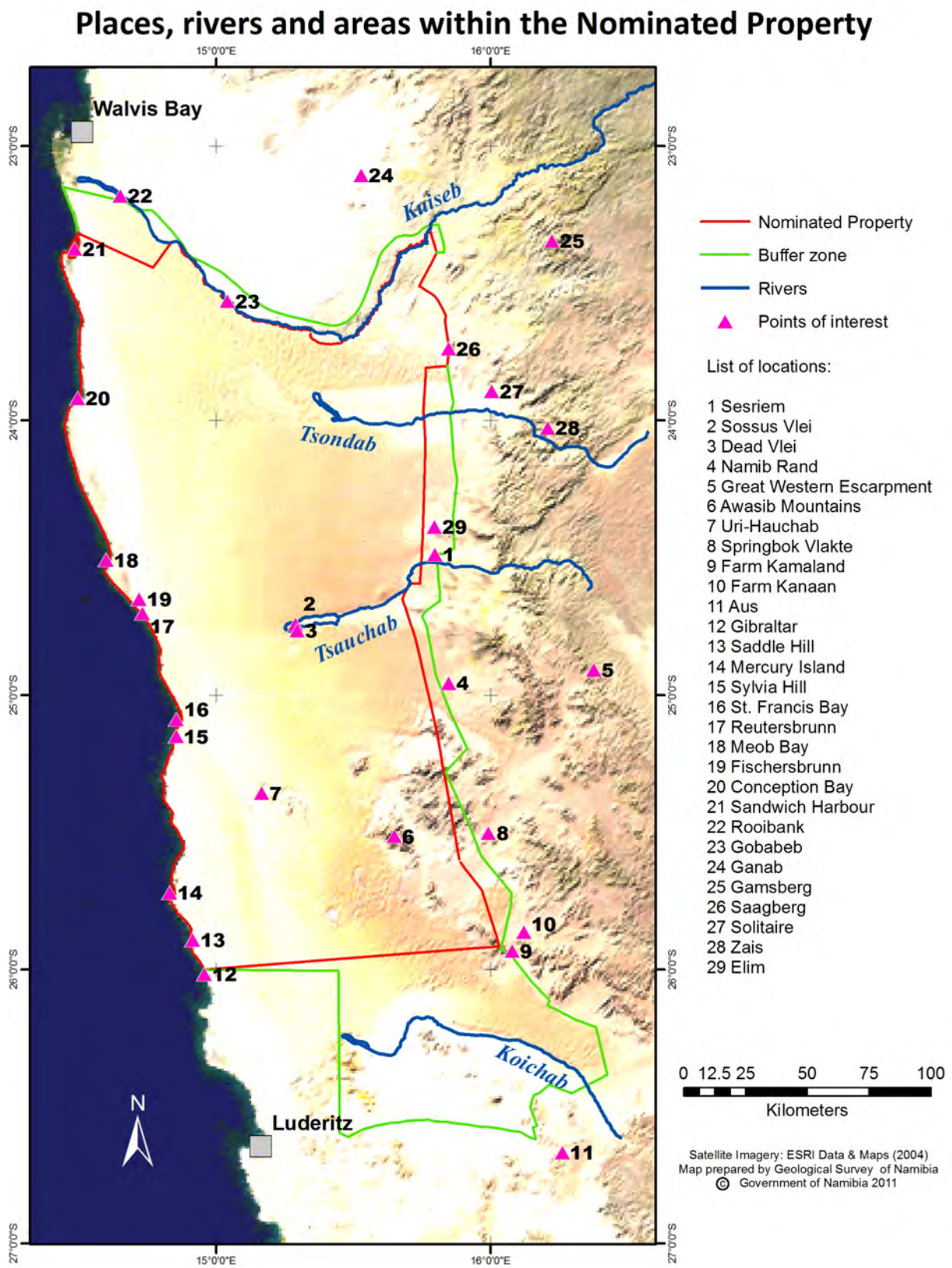




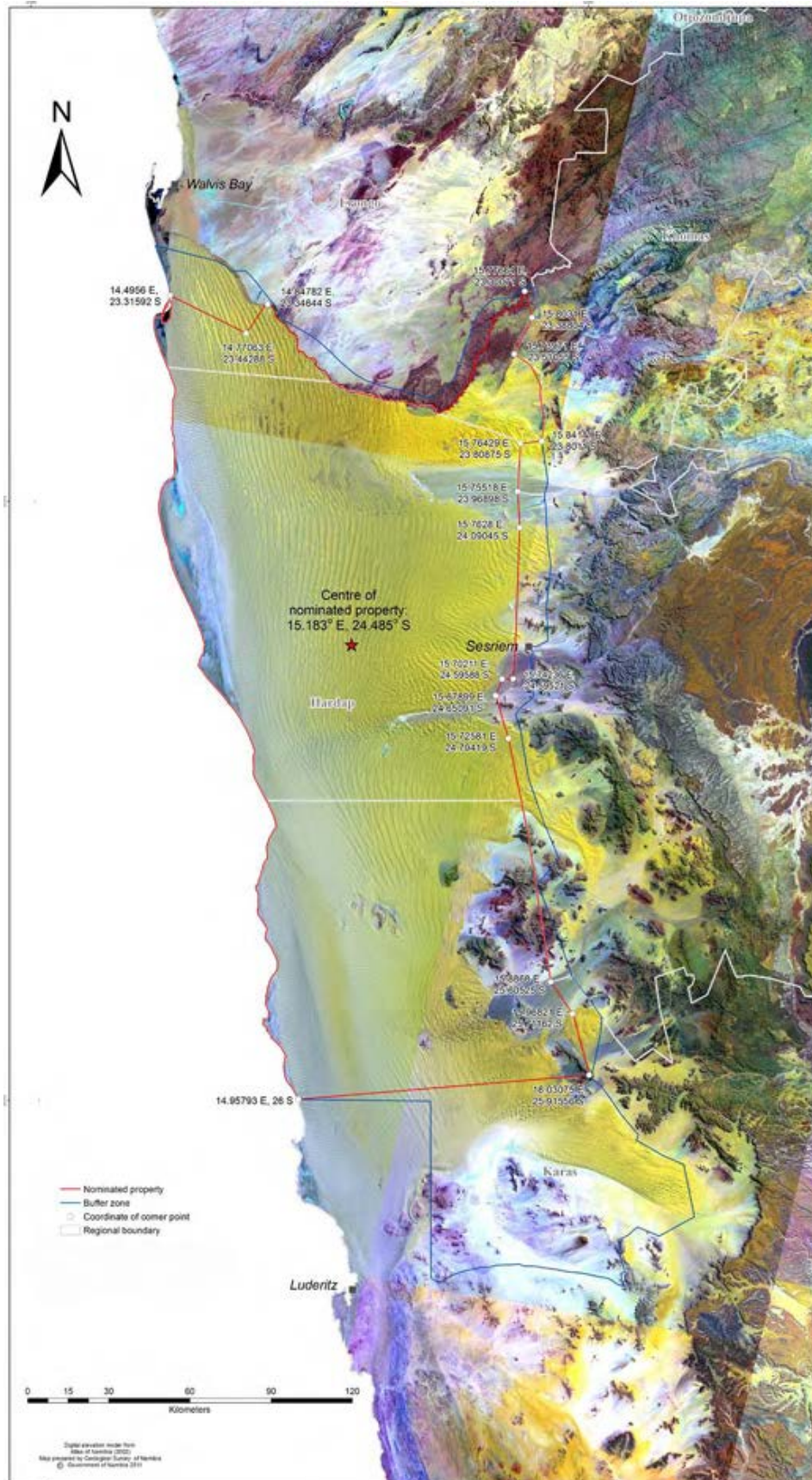
Map 1.e.4: Major Substrate Habitats of the Namib Sand Sea



Map 1.e.5: Important localities within the Namib Sand Sea



Map 1.e.6: Annotated Landsat Image of the Namib Sand Sea





1.f AREA OF NOMINATED PROPERTY AND PROPOSED BUFFER ZONE

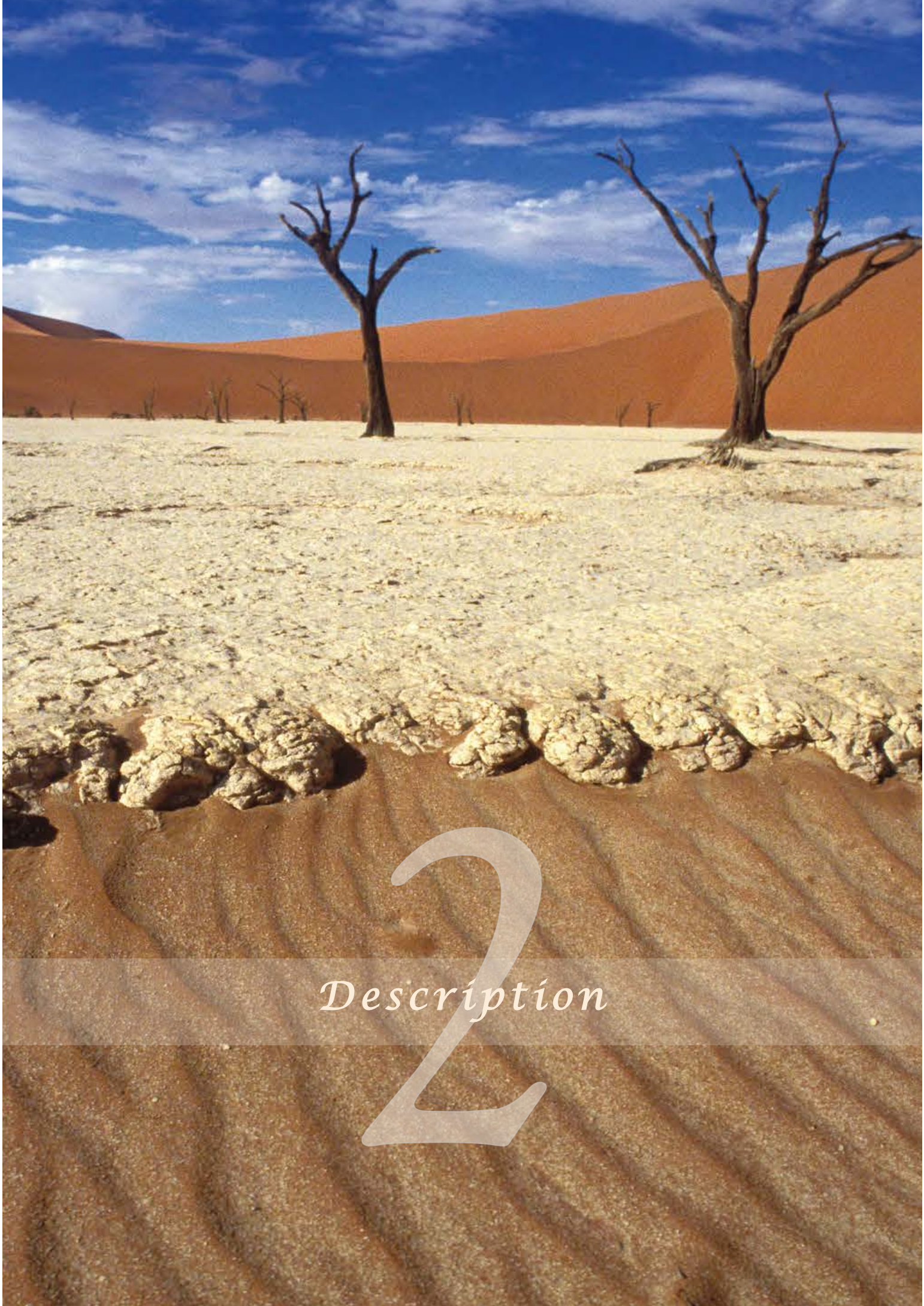
Area of nominated Property: 3,077,700 ha

Buffer zone: 899,500 ha

Total: 3,977,200 ha



Figure 1.f.1: Digital elevation model of the Namib Sand Sea on the African continent (Bowen/NASA)



Description



The iconic Deal Vlei with its 800-year-old *Acacia erioloba* ghost forest near Sossus Vlei (Paul van Schalkwyk)

2 Description

2.a DESCRIPTION OF PROPERTY

The Property being proposed as a World Heritage Site in this Nomination Dossier is the Namib Sand Sea (Annex 2). This Property is primarily composed of an ancient sand sea underlying a modern, active sand sea both of which are known together as the Namib Sand Sea. Components of the Property consist of the sand sea itself (84%), gravel plains and gramadullas (8%), coastal pans/flats (4%), eastern rocky hills (3%), inselbergs surrounded by the sand sea (1%), and a coastal lagoon (Sandwich Harbour), endorheic pans, ephemeral rivers and rocky shore all comprising less than 1% of the nominated Property. The superimposed ancient and modern Namib Sand Seas are the products of interactions between the atmosphere, the ocean and the land. Abundant sand, weather and climate are the key elements integrating these interactions and the spectacular dune-scapes. Of the climatic elements themselves, strong winds from various directions linked to rain and fog have overriding influence on the key attributes of the past and present Namib Sand Sea. These attributes embrace the structure, including aesthetics, dune-scapes, records of the earth's evolution and elements of educational and scientific interest, and the ecological function, *in-situ* biodiversity conservation and ongoing evolution, of the Namib Sand Sea.

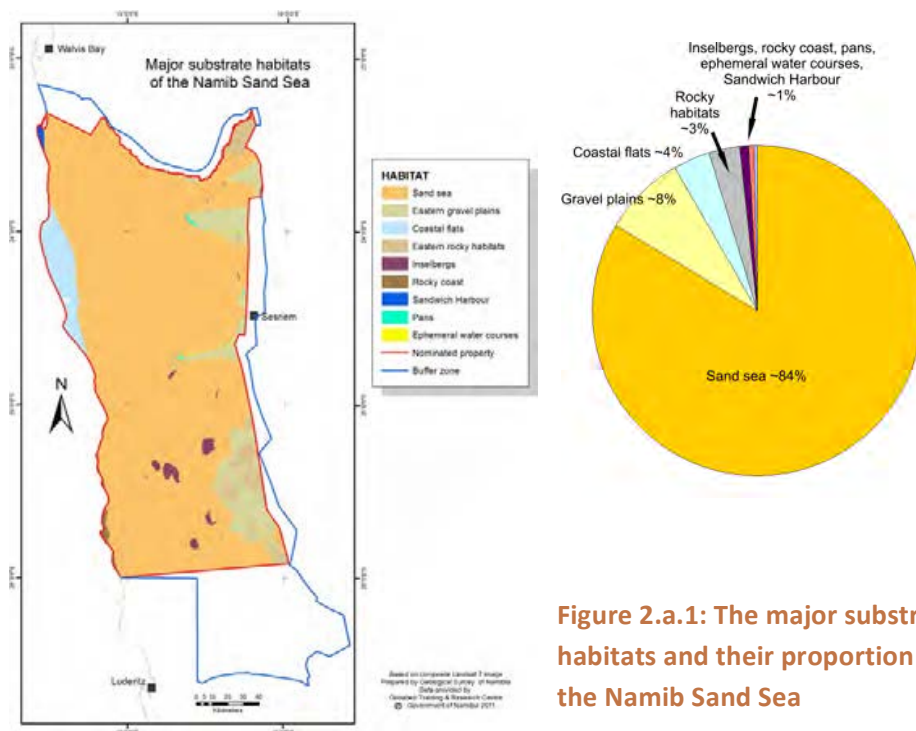


Figure 2.a.1: The major substrate habitats and their proportion in the Namib Sand Sea

2.a.1 CLIMATE¹

The arid climate of the Namib Desert, in which the Namib Sand Sea is located, is the long-standing, overriding dynamic of the Namib Sand Sea. The aridity is exemplified by little rain, partially ameliorated by coastal fog. Strong winds, in different seasons from different directions, are the second key factor influencing attributes of the Namib Sand Sea.

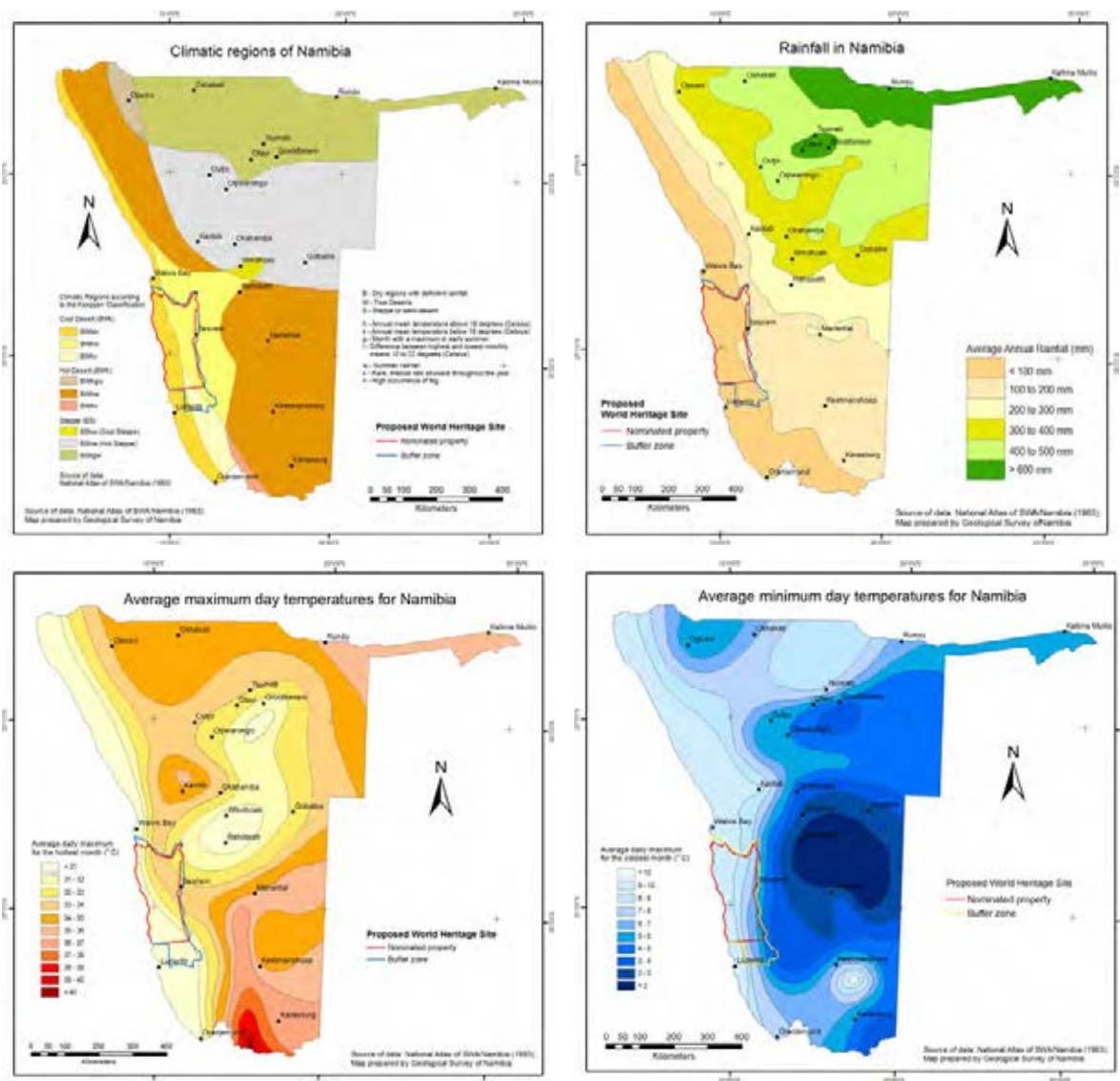



Figure 2.a.2: The Namib Sand Sea within the context of Namibian climate

The extreme aridity of the Namib Sand Sea leads to exceptionally clear visibility due to a very low concentration of aerosols in the atmosphere. Conditions for atmospheric visibility have been extensively studied when the Gamsberg near the north-eastern boundary of the Namib Sand Sea was evaluated as a potential site for astronomical observations. That research proved that the eastern margin of the Namib is one of the areas with the clearest visibility in the world. The lack of



atmospheric moisture for most of the year, especially away from the coast, combined with the virtual absence of silt and clay particles picked up by the wind and suspended as dust, provide for exceptionally clear viewing conditions over most of the Namib Sand Sea during most times of the year. That results in exceptional panoramic vistas with distant landscape features seeming to be within touching distance.

At night the clarity of the sky reveals other astounding views. The nightly spectacle exhibits myriads of stars and iconic constellations such as *inter alia* the Southern Cross, Orion the Hunter, and the Milky Way galaxy. Even when the full moon is so bright that one can distinguish topographical features and dune colours several kilometres away, the night sky simply transposes the daytime panorama for another, equally impressive. The Southern Hemisphere constellations in all their glory, undiminished by light contamination from any population centres or industrial pollution, never cease to amaze.

Rain: The Namib Sand Sea lies on the western, arid half of southern Africa. This situation is brought about by a combination of global air circulation, the Namib's location on the western, rain-shadow side of the African subcontinent, and currents in the oceans surrounding the southern part of the continent, particularly the cold Benguela flowing up the west coast.

The Namib Sand Sea lies in that part of southern Africa dominated by the sub-tropical belt of high pressure encircling the earth. Air circulates at great height, losing its moisture over the equator, and sinks in high pressure cells or anticyclones that are centred over the tropics of Capricorn and Cancer. This subsiding air and the cool surface temperatures prevent the formation of atmospheric instability in summer that is necessary for rain to fall. In winter, however, circulation over the southern African subcontinent is dominated by a single large high pressure cell over the interior that is responsible for the clear, dry conditions experienced over the Namib Sand Sea. This high pressure cell is thought to be one of the most stable air masses on the globe.



Figure 2.a.3: Apollo 17 photograph of anticyclone sweeping past the Namib Sand Sea (NASA Johnson Space Center, 7 December 1972)



Figure 2.a.4: Cloudburst over the Namib (Gobabeb Centre)

The latitudinal dry conditions are further enhanced by a semi-permanent high pressure cell over the cold Benguela current that suppresses evaporation over the ocean as well as the potential influx of moist air during the austral summer when the continental high pressure weakens. This effectively contributes to preventing conditions suitable for rain over the Namib Sand Sea resulting in almost permanent dry conditions. These hyper-arid atmospheric conditions are a permanent climate feature of the Namib Sand Sea only rarely interrupted by global changes in circulation that may result in rain over the Namib.

Summer rain over the Namib Sand Sea, on the rare occasion when it falls, is occurs when warm, moist air is blown in from the east. Rainfall may then range from less than 20 mm in the west on the coast to more than 300 mm in the east. In winter, low pressure cells from the South Atlantic anticyclone pass over the southern tip of the continent, occasionally bringing rain to the southern, 'winter rainfall' part of the Namib Sand Sea. Winter rainfall, if it occurs at all, usually totals less than 30 mm.



Figure 2.a.5: Soaking winter rains at Sossus Vlei (Olivier)

Rain over the Namib Sand Sea is therefore exceptional as well as highly seasonal, with most coming from summer rains. Infrequent convection currents over the land initiate the thunderstorms that produce most of the rain in the interior. Occasionally, tongues of low pressure from the tropics penetrate further south than usual and, combined with the surface warming over the ocean known as the Benguela Niño, may bring widespread, soaking rains over at least the eastern portion of the Namib Sand Sea as experienced every few decades.



Fog: Fog, the crucial life-giving moisture source that supports the spectacular biodiversity of the Namib Sand Sea, is simply moisture in the air that reduces visibility and deposits water on any object in its path. Depending on a variety of factors including the rate of cooling of the moisture in the air, fog may materialize as minute droplets seriously obscuring visibility or as something resembling a wet drizzle almost like rain. Fog produces five times as much moisture as rain in the western sand sea and is much more predictable.

Two types of fog predominate, sometimes occurring at the same time. Within about 15 km of the coast, advective fog at less than 200 m high is borne inland on south-westerly winds, often arriving in the afternoon. Such fog forms when humid air crosses the cold Benguela upwelling and results in moderate precipitation. In contrast, high fog, which forms at about 200–600 m below a strong inversion layer, represents intercepted low status and strato-cumulus cloud. This high fog may reach inland as far as the Great Western Escarpment but most usually is intercepted by dunes at about 20–60 km inland.

Fog-water precipitation is recorded from high fogs about 60–120 days per year in the Namib Sand Sea. Using a one square metre fog collecting screen, up to 15 litres per fog day may be collected, although the long-term average is more like 1 litre per fog day. Long-term measurements indicate that the annual amount of fog precipitation can vary widely and has a distinct effect on the population dynamics of the fauna and flora of the Namib Sand Sea.

Winds: Potent east winds during winter bring dust, heat, organic detritus and flies. Bitingly cold northerly winds on the coast, and strong afternoon winds from the south-west in summer are part of the variable pattern. All of these features are largely explained by global circulation patterns and by local conditions of temperatures and topography.

The wind- and storm-generated long-shore drift of the Benguela Coastal Current, driven by the upwelling cells, has transported sand and marine gravels northwards along the coast since time immemorial. The peacefulness of a calm morning can be deceptive when the dominantly southerly to south-westerly winds, which are responsible for slowly transporting the sand northwards and inland, build up in the afternoon and sometimes keep blowing well into the night. During storms, the flying sand is highly abrasive.

Summer winds: The South Atlantic anticyclone lying offshore and to the south of the Namib Sand Sea is mainly responsible for the strong onshore winds experienced at the coast, but it is also assisted by the temperature contrast between cold ocean and warm land mass. Due to Coriolis forces, west wind is deflected to the left of its course and blows mainly from the south-west over the Namib Sand Sea. The wind blows strongest from September to November. The winds usually begin at the coast in the late morning and penetrate across the entire Namib Sand Sea by evening, dying at nightfall. There is a



Figure 2.a.6: Fog over the dunes (Gobabeb Centre)



trend of decreasing intensity of the south-westerly winds from the southern Namib Sand Sea northwards. The coastal area just south of the Namib Sand Sea, experiences the highest average wind velocity in southern Africa, with winds in summer varying between 30 and 80 km/h, easily transporting sand onto shore and over the dunes. Winds blowing from the northwest begin in the late afternoon and continue into the night. These dominate in summer, most especially between December and February, and often bring fog.

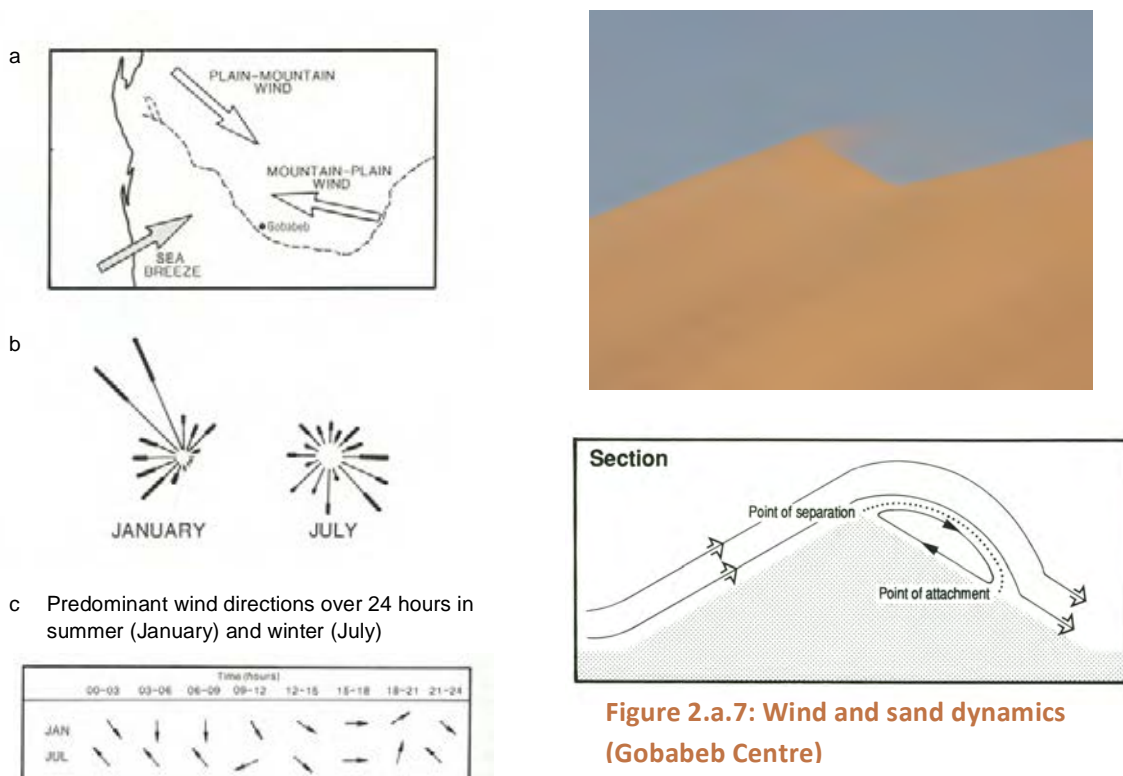


Figure 2.a.7: Wind and sand dynamics (Gobabeb Centre)

Winter winds: In winter the influence of the South Atlantic anticyclone weakens and the South African anticyclone, centred over the sub-continent, becomes more important. By far the strongest winds are the katabatic east or 'berg' winds, which are generated in winter when cold air from the sub-zero interior highlands flows westwards off the escarpment. The winds heat up and speed up as they cross the desert, stir up huge quantities of fine dust and have temperatures of more than 30°C and speeds of up to 80 km/hr when they reach the coast. The resulting dust plumes extend as far as 200 km out to sea. A description by Thomas Baines, explorer in southern Africa in 1861, may seem familiar to anyone who has experienced this wind at the coast: 'Toward noon it blew very hard from the east, bringing down such clouds of sand that we could not see eighty yards in any direction. To work outside was an impossibility, and the flies, driven in for shelter, rendered the house almost untenable...' East winds penetrate to the coast only on about 10 to 15 days a year but are very memorable and significant nonetheless for their impact on the geomorphology and ecology of the Namib Sand Sea.

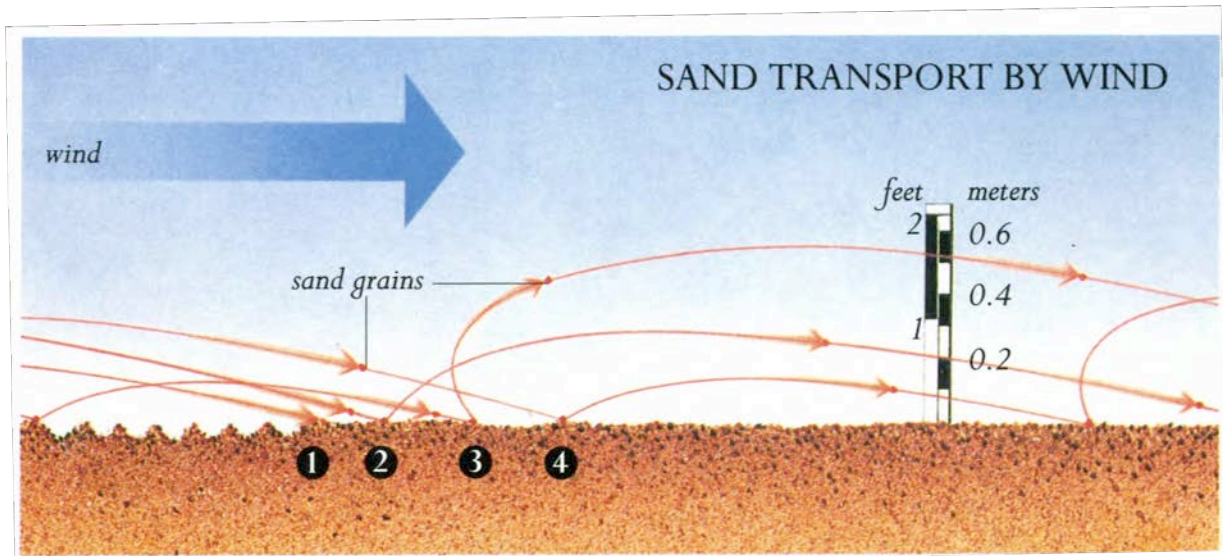


Figure 2.a.8: Sand saltation driven by wind (Hesp)

The sediment-moving power of the east wind is astounding. The dust/sand plume near the Orange



River mouth of 9 May 1979, south of the Namib Sand Sea, resulted from north-easterly winds averaging over 50 km/h. The plume extended about 150 km to sea, and covered an area of about 20,000 km². Assuming that this dust would settle to a thickness of one millimetre, the total quantity of sediment moved was about 50 million tonnes – the same order of magnitude as the annual input of sediments borne by the Orange River in a normal year! Clearly the Namib Sand Sea is a dynamic, variable place.

Figure 2.a.9: Dust plumes in the central Namib driven by the Southern African continental low-pressure system locally known as 'The East Wind' (Goddard Space Center, NASA, 13 June 2003)

2.a.2 GEOGRAPHY AND GEOLOGY¹

The Namib Sand Sea is actually a system of two dune seas, one on top of another. The older is semi-consolidated, and as old as 21 million years. The younger is unconsolidated and has been active for about 5 million years. It covers the older system and is still accumulating. The uniqueness of both sand seas lies in the fact that they are quite different from other large sand seas elsewhere in the world, as they have not been derived from erosion of the hard bedrock on which they lie.

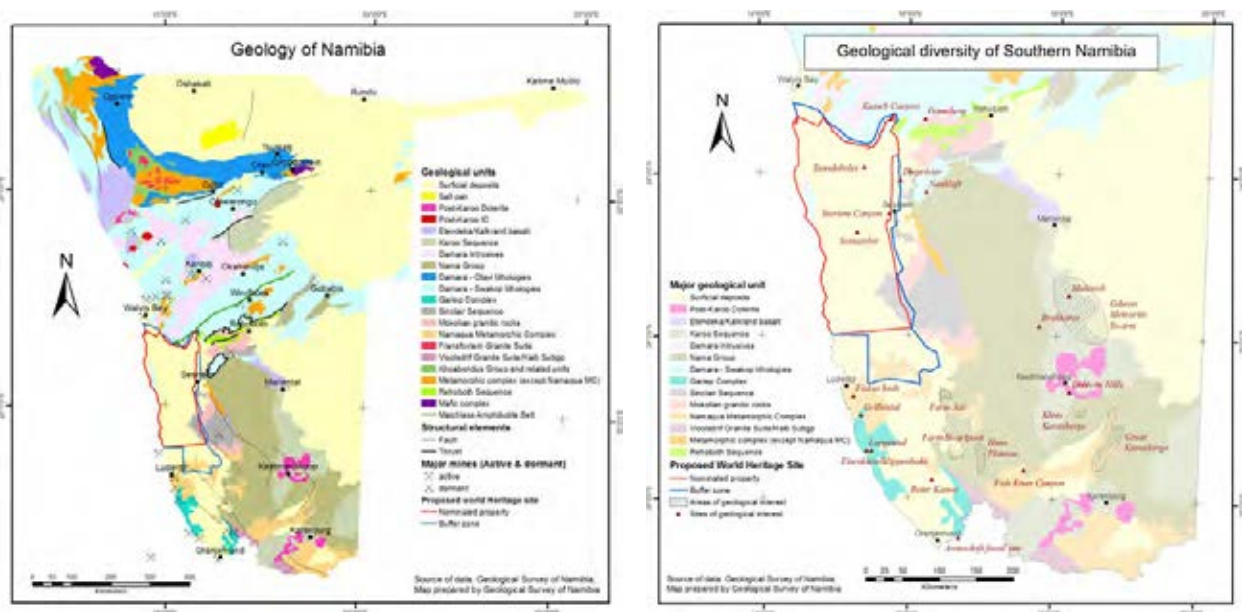



Figure 2.a.10: Geological setting

Although having accumulated in the arid to hyper-arid central Namib, these dune sands originated under the humid conditions of central to eastern South Africa in the catchment area of the Orange River and its main tributary, the Vaal River. Three contrasting ‘conveyor belt systems,’ acting in unison over much longer than the 21 million years recorded by the fossils in the basal aeolianites, are the source of the Namib Sand Sea sand. These systems comprise fluvial transport by the Orange River itself, a coastal long-shore drift transporting the sediments in the marine system and the aeolian transport by coastal winds that finally deposit the sands in the central Namib Sand Sea. Thus, both central Namib Sand Seas are displaced and aeolian derivatives of the huge inland Orange/Vaal River Basin and the sandstone of the Lesotho highlands.

But the Namib Sand Sea is not just made up of shifting, unconsolidated dunes or aeolian sheet sands. The bedrock under the two sand seas forms a gradually rising peneplain studded by occasional inselbergs. Westerly flowing rivers had cut valleys into the Namib bedrock even before the first dune sands were deposited. Subsequently, rivers flowing off the Great Western Escarpment in the east during summer rains deposited fluvial gravels from time to time on the eastern dune sands. All the rivers flowing off the Great Western Escarpment just to the east of the sand sea feed fresh rainwater into the old palaeo-valleys and extensively into the older semi-consolidated sand sea. The water,

¹ The geological components of the description of the nominated Property are primarily derived from: Schneider, G.I.C. 2011. The Namib Sand Sea World Heritage Site, Annex 4 of this document and publications listed in the bibliography (Section 7.e and Annex 21).



reaching the coast by this means and emerging as small springs at hidden, isolated locations, is many thousands of years old when it again attains the surface.

Evolution of the Namib Sand Sea: The understanding of geological processes that have led to the evolution of the present Namib Sand Sea are related to plate tectonic processes that shaped the past and present face of the earth. The geological units underlying modern Namibia were part of the huge landmass of Gondwanaland. This ancient continent broke apart some 128 million years ago, and individual pieces, including Africa, drifted apart from then on. During the Palaeogene, between 65 and 23 million years ago, Africa separated from the neighbouring parts of Gondwanaland and emerged as a continent of its own.

As a result of these plate tectonic movements, the southern African subcontinent underwent various stages of uplift, and the present interior was subject to erosion. Deep erosion from the end of the Cretaceous onwards, 65 million years ago, caused the Great Western Escarpment to migrate eastwards, leaving behind the low-lying peneplain occupied by the Namib Sand Sea today. Consequently, the geological succession in the Namib Desert consists of local Cretaceous deposits and extensive terrestrial Cenozoic to recent sediments.

Platform underlying the Namib Sand Sea: The bedrock, upon which the ancient and modern Namib Sand Sea dunes rest, records several major phases of crustal evolution relating to the amalgamation and breakup of the Rodinia and Gondwana Supercontinents. Outcrops occur sporadically along the coast, in a few inselbergs within the dunes and along the eastern border of the dune belt. The largest coastal outcrop area is the one between Conception Bay and Meob Bay.

Erosion by means of escarpment retreat under humid conditions produced a Namib-wide bedrock bevel or peneplain, which stretches the full north-south length of Namibia's coast and extends from sea level in the west to an elevation of 800–1000 m at the eastern edge of the central Namib dunes. Inselbergs of Namaqua and Sinclair Formation rocks, such as the Uri-Hauchab, Hauchab and Awasib Mountains, dot this bevel in the southern half of the Namib Sand Sea dune field and along its eastern edge but are conspicuously absent in the northern half. Fossils in fluvial-palustrine deposits in the northern Sperrgebiet and just south of the central Namib Sand Sea suggest that the pre-sand sea fluvial phase ended at about 21 Ma.

By the end of the Cretaceous, the Orange River was already a major drainage system and deposited vast amounts of sediments in a huge submarine offshore delta.

The Tsondab Sandstone: The Orange River system has been in existence since the early Cretaceous transporting sediment westwards. It built out a huge delta in the widening South Atlantic Ocean throughout the Cretaceous and the Cenozoic. The river mouth and the delta are located in an area where almost continuous and often powerful southerly winds of the South Atlantic Anticyclone drive a vigorous long-shore drift that transports gravel, diamonds and sand for hundreds of kilometres northwards and back onto the beaches of the Namibian coast. The diamondiferous gravels of the Orange River and the Namibian raised beaches contain pebbles that can be traced to very specific formations deep in the South African interior. The same powerful southerly winds blow the sands

back onshore, often along well defined sand-transport corridors, and have built up both sand seas over millions of years.

High sea levels, up to 170 m above the present sea level during the Eocene, in combination with long-shore drift, deposited marine and marginal marine sediments on the Namib bedrock bevel up to 30 km inland of the present coastline. Similarly, sea-level falls of as much as -120 m or more during the Oligocene exposed huge areas of the offshore Orange River delta and the continental shelf to its north. Thus, large areas of the Cretaceous and Cenozoic marine sediments in the delta and on the continental shelf were exposed to the strong southerly winds for long periods of time and were huge sources of sand for the two central Namib Sand Seas.

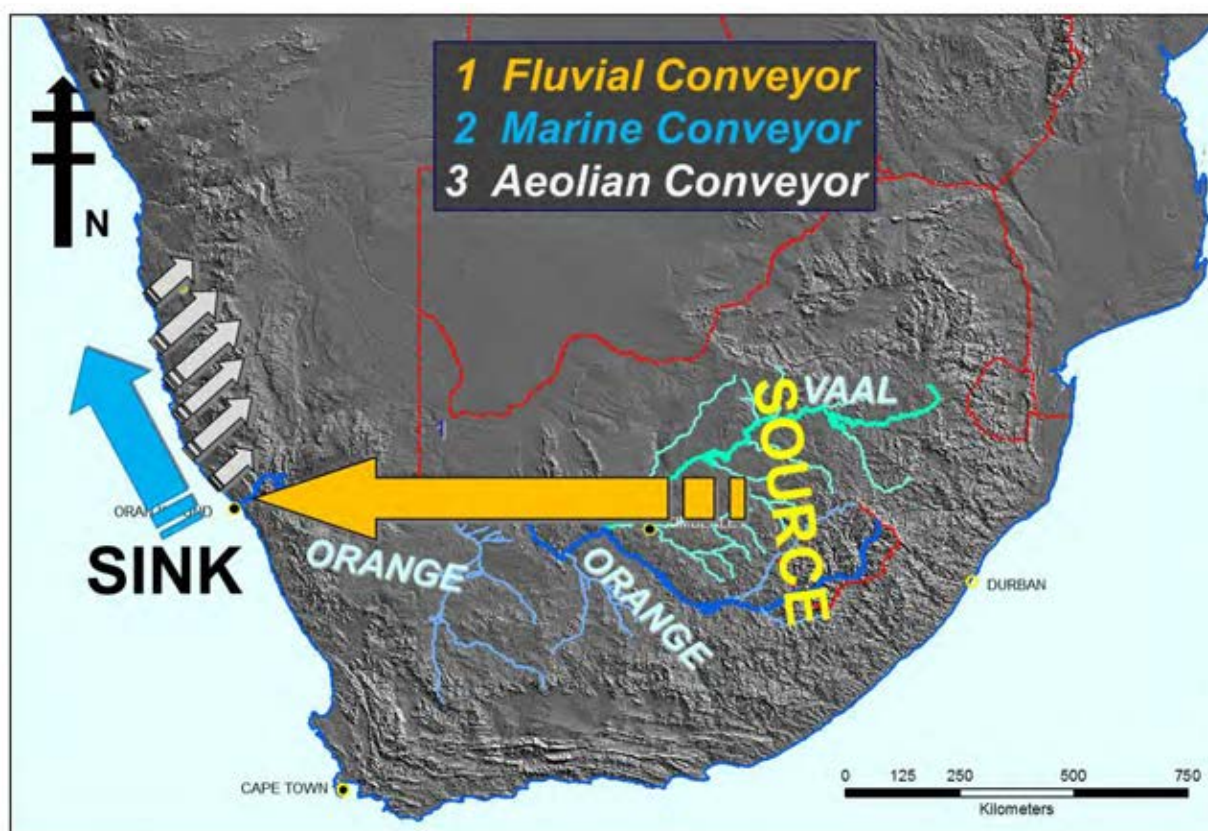


Figure 2.a.11: Fluvial, marine and aeolian conveyor system transporting sand from the eastern highland of southern Africa to the Namib Sand Sea (after Bluck, Ward, Cartwright & Swart)

It was during the early Miocene, that the first aeolian sands of the central Namib Desert began to accumulate onshore. These eventually covered the full length and breadth of the Namib Desert from the Orange River to the Kunene River and from the coast to the valleys in the foothills of the escarpment. These consolidated to form the Tsondab Sandstone Formation. Subsequent erosion has removed most of this sandstone north of the Kuseb River but it is still extensively preserved beneath the unconsolidated dune sands of the Sossus Sand Formation in the central Namib – the Namib Sand Sea. In the Namib Sand Sea, the Tsondab aeolian sands are interbedded with escarpment-sourced fluvial sands and gravels along the eastern edge of the sand sea.

The partial cementation of the Tsondab deposits was completed towards the end of the Miocene. During a prolonged period of relatively higher summer rainfall that followed, flood waters of the main westerly flowing rivers cut broad but rather shallow river channels into, but not through the Tsondab Sandstone and deposited westward-fining river gravels in these valleys to within 25 km of the coast. The valley gravels and the underlying sandstone gradually became cemented by calcrete that precipitated from groundwater, which continued to flow in these valleys long after gravel deposition had ceased. Some of the most spectacular outcrops of these late Miocene, calcrete-cemented gravels are in the Sesriem Canyon on the eastern boundary of the Property.



Figure 2.a.12: Tsondab Sandstone cliff exposed at Dieprivier (Miller)

Sands of the Namib Sand Sea: The successive Plio-Pleistocene glaciations in the northern hemisphere, and the associated melting of the arctic ice sheet at the end of the glaciations, resulted in global climatic variations and sea level changes. The strong long-shore drift along the Namib coast transported much of the sediment from the offshore delta of the Orange northwards to form gravel and sandy beaches at various sea levels. The sand from these beaches has been picked up by the wind and blown inland to form the Namib Sand Sea.

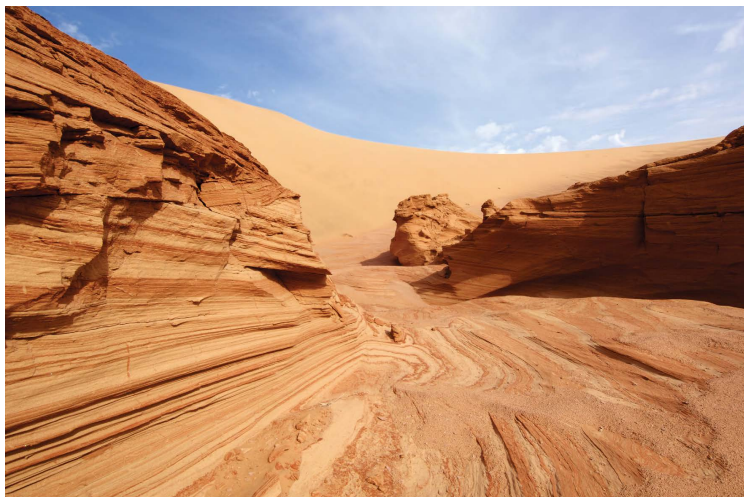


Figure 2.a.13: Sossus Sand Formation overlying Tsondab Sandstone with its ancient bedding plains (van Schalkwyk)

The coastline is characterised by a number of south-facing embayments. These bays serve as sources of sand for the central Namib Sand Sea, and occur within one of the highest energy aeolian systems on earth. Linear valleys extending northwards from the bays are swept by winds with speeds exceeding 100 km per hour and transporting enormous amounts of sand. The aeolian sands of the unconsolidated, Pliocene to present-day Sossus Sand Formation were and are partially being fed by trains of fast-moving

barchan dunes, some of which arise at beaches with north-westerly orientations as far as 100 km south of the Namib Sand Sea. That sand is gradually transported northwards and north-eastwards to contribute to the Sossus Sand Formation of the Namib Sand Sea. The heavy mineral suites in both the



Tsondab and Sossus Formations are identical to those of the Miocene and present-day fluvial sands of the Orange River. To a limited extent, aeolian abrasion of the Tsondab Sandstone contributes to the younger Sossus Sand Formation.

The main wind directions are southerly along the coast and south-westerly further inland but there are occasional strong north-westerly and easterly winds. The overall movement of sand is consequently toward the north or north-east. The greatest rate of movement is along the coast where southerly wind blows rather strongly most afternoons and evenings. Barchan and longitudinal dunes prevail in this region. Changes in wind direction change the facing direction of the dune crests. On the eastern edge of the Namib Sand Sea near Sossus Vlei, the wind direction is more variable from day to day. Consequently, this is the region where stellate and pyramid dunes are developed.

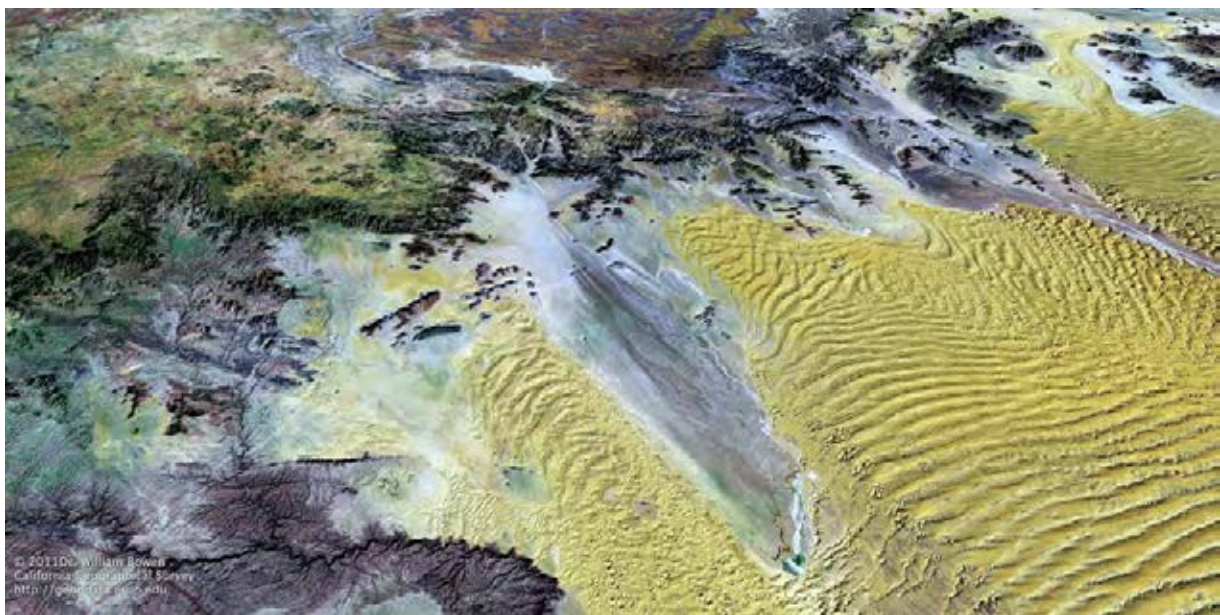


Figure 2.a.14: Tsondab River flowing on Tsondab Sandstone parting modern dunes (Bowen/NASA)

The present Tsondab and Tsauchab Rivers have cut new channels into their old palaeovalleys and their end points are the Tsondab and Sossus Vleis, respectively. Several deposits of white, calcareous pan clays in the Sossus Vlei area occur at elevations up to 2–3 m above the present level of the Sossus Vlei clays and are underlain by unconsolidated aeolian sand. These show that the Tsauchab River has cut its channel gradually deeper with time and that the location of its end point has not always been exactly where it is today. The two rivers, the Tsondab and Tsauchab, have relatively small catchments in the escarpment region where rainfall is low. Floods in the Tsondab and Tsauchab Rivers only reach their respective end points occasionally.

Both Namib Sand Seas are, therefore, outstanding and unique examples of the interaction of a major river system draining into a highly dynamic coastal environment in which some of the most intense winds on earth drive a powerful littoral and sub-littoral long-shore drift system which transports the offshore fluvial sediments northwards and back onto beaches. The winds pick up the sands from the beaches and carry them northwards and north-eastwards to form the dunes. The average combined thickness of the two ergs together increases northwards to 24° 30' S then decreases north of that. The maximum estimated thickness of the successive sand accumulations is 475 m.

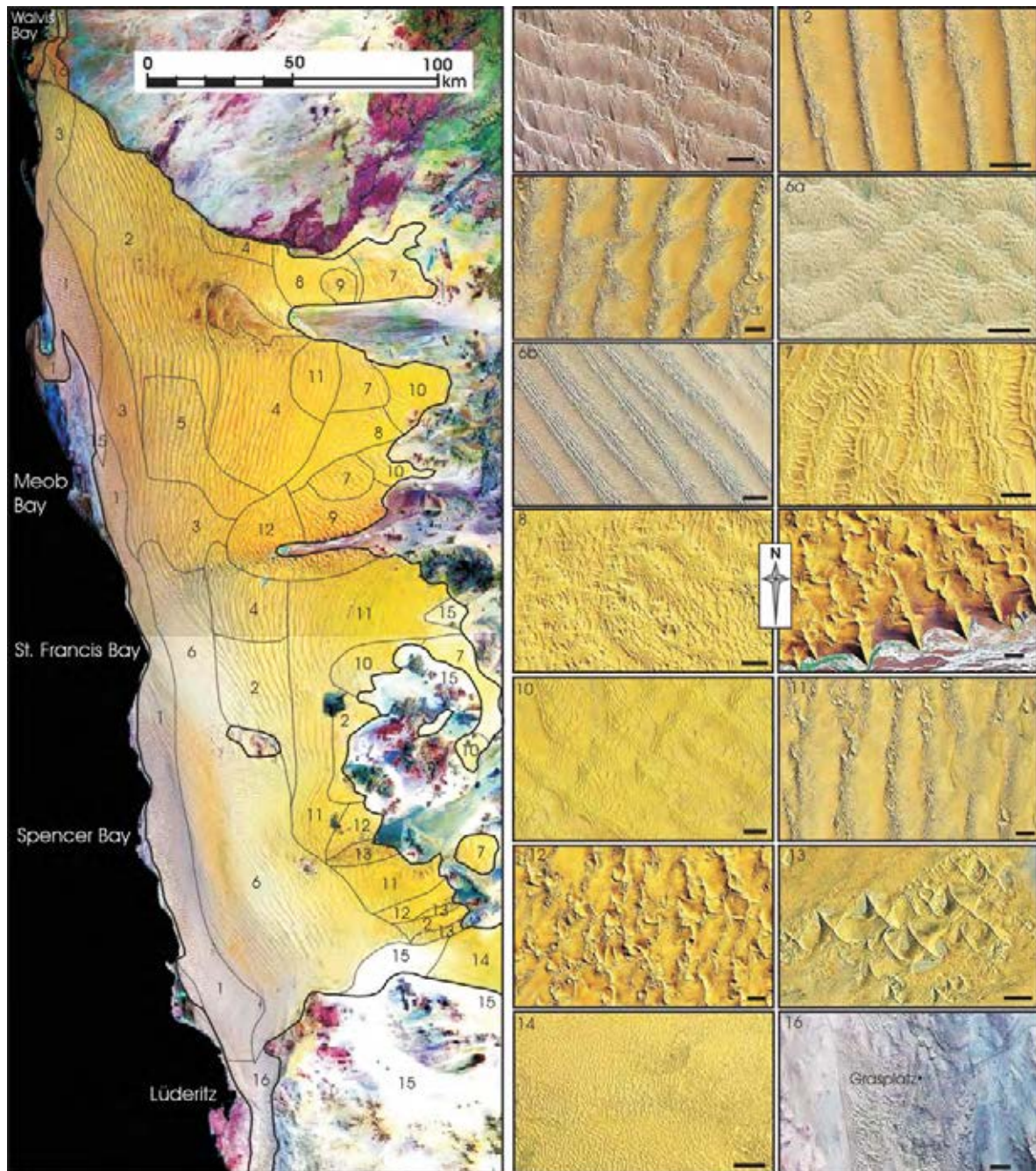


Figure 2.a.15: Superimposed on this Landsat image are areas where these main types can be identified. The bar scale on the Landsat images of the various dune types is 2 km: 1: transverse or compound crescentic dunes, 2: longitudinal ridges or linear dunes, 3: transition forms between transverse and linear dunes, 4: branching longitudinal ridges or linear dunes, 5: network complex within the linear dune system, 6a: zibar dunes, 6b: zibar-silk dune system, 7: lace dunes, 8: honeycomb structure, 9: honeycomb structure with stellate dunes and saw-tooth dunes, 10: giant honeycomb structure, 11: warty dune ridges with stellate dunes, 12: high chaotic dunes, 13: pyramid dunes, 14: dune sand plain with craters, 15: sand sheets, 16: aeolian transport corridor with barchanoid dunes (Miller)



Dune formations: The sixteen recognized dune types in the Namib Sand Sea can be consolidated into three main dune types: transverse dunes in a coastal strip, linear dunes in the centre of the sand sea and star dune systems in the east. These are the sixteen wondrously varied dune types that integrate to form the spectacular dunescape with its interplay of shape, colour, movement and habitat making up the Namib Sand Sea.

Ephemeral Rivers: Not immediately apparent are the late Miocene to early Pliocene courses of the Kuiseb, Tsondab and Tsauchab Rivers within the Namib Sand Sea. These palaeo-rivers cut broad valleys up to 30 m deep into, but not through the Tsondab Sandstone. Continuous sheets of westward-fining river gravels of the Karpfenkliff Formation trace out these valleys. The Karpfenkliff gravels of the palaeo-Kuiseb River crop out between regularly spaced transverse dunes, but the gravels of the other two rivers are almost dune free. The valley of the palaeo-Tsondab River is the best exposed and most readily recognisable between the high valley flanks for 80 km from the eastern edge of its gravel plains, where it is 25 km wide, to 35 km northwest of Tsondab Vlei where it is only 2 km wide. A narrow strip of dunes separates the Tsondab Vlei from the exposed western 30 km of this palaeo-valley. The Karpfenkliff gravels of the Tsauchab River are totally dune free all the way down to Sossus Vlei. This palaeo-valley is not at all obvious as the high flanks of the older valley are completely covered by dunes of the Sossus Sand Formation with saw-tooth dunes down the valley flanks and onto the valley floor and stellate dunes on top of the valley flanks.



Figure 2.a.16: Ephemeral river penetrating the Namib Sand Sea (van Schalkwyk)

The present Tsondab and Tsauchab Rivers follow and have cut new channels into the old palaeo-valley gravels and the underlying aeolian Tsondab Sandstone, but their end points are the Tsondab and Sossus Vleis, respectively, deep inside the dune field of the Namib Sand Sea. The unconsolidated dunes of the Sossus Sand Formation further west prevent these rivers from reaching the sea, however the vleis occasionally fill up with flood waters after good rains in the interior.

Mineral Resources: The only minerals that have ever been mined in the nominated area are diamonds. In the early Cretaceous, the predecessor of today's Orange River was a slow flowing, meandering river that deposited millions of tons of fine sediment into the sea. This changed when southern Africa underwent major uplift that led to the incision of river beds and fast-flowing rivers capable of transporting diamonds, together with considerable amounts of sand and gravel, all the

way to the Atlantic Ocean. Upon reaching the sea, these sediments were distributed along the



Figure 2.a.17: The lure of diamonds has been key to our understanding of the geology (Schneider)

southern Atlantic coastline. While the fabulously rich Namibian diamond deposits occur further south than the Namib Sand Sea, the Namib Sand Sea itself did contain smaller stones of lesser economic value that supported small-scale mining operations in the past, until the known deposits were mined out. However, extensive research into the formation of the Namibian diamond deposits contributed to the generation of knowledge about the age, formation and general geology of the central Namib Sand Sea.

The Namib Sand Sea fossil record: The strata in the Namib Sand Sea contain a rich and diverse fossil record that has proved to be useful for determining the timing of events in the desert and aspects of its palaeoclimate and palaeo-environment. The fossils comprise three major classes – trace fossils (ichnofossils such as burrows and foot prints), bioconstructions (fossilised spider webs and termite nests for example) and body fossils (remains of invertebrate shells, vertebrate skeletons and eggshells).

The Neogene strata in the Namib Sand Sea consist predominantly of aeolian sands with interbedded marine, fluvial, lacustrine, plaudal and pedogenic deposits. Near the coast there are interbeds of marine deposits up to 50 metres above present-day sea-level, and these strata often contain rich marine faunas (bivalves, gastropods). Fossils have been found at numerous points throughout the Namib, and these have permitted the age of the various deposits to be ascertained within reasonable limits, using biochronology (relative age determination of strata using fossils). The fossils also allow aspects of the palaeo-environment to be determined.

During the Early Miocene, some 21-19 million years ago, the region was semi-arid with savannah and steppe vegetation. By 16 million years the Namib Desert had become hyper-arid, with extensive deposition of aeolianites. Desert conditions have dominated ever since, although there is evidence that there were periods of greater humidity during which rivers flowed, lakes formed and calcrete crusts developed far into the desert.

Trace fossils are ubiquitous and abundant throughout the desert, particularly rich deposits being known near the coastal strip at Meob, where carnivore and ruminant footprints are well preserved and common. Elsewhere traces of termite activity, coleopteran burrows, rhizoliths and other kinds of bioturbation are widespread and attest to the fact that the desert supported a rich and diverse fauna and flora throughout its existence. Well preserved trails of the golden mole *Eremitalpa* and burrows of lizards and rodents are locally common in the aeolianites, especially near Awasib. Rhizoliths of various diameters reveal the former presence of grass and trees in the Namib Sand Sea.

Bioconstructions are varied and widespread in the aeolianites of the Namib Sand Sea. The commonest kind of bioconstruction comprises latrines and hives of termites, notably the sand termite *Psammotermes*, and the harvester termite (*Hodotermes*). Perhaps the most unusual bioconstructions preserved in the Namib are roof webs of the buck-spool spider *Seothyra*, a genus that prepares a four-lobed trap door of thick web on the sand surface which has been found fossilised in various places in the desert, including Sossuvlei and the Tsondab Flats.

Body fossils are of particular interest as they yield information about the ages and palaeo-environments of the deposits. Fossil rodents and carnivores were found at Sossus Vlei, Awasis, Tree Pan and Meob Bay. Among the mammalian fossils found in the Namib, rodents predominate, in particular Pedetidae (spring hares) and Muroids (mice and rats). The Pedetidae underwent significant evolution during the past 21 million years and are thus useful for biochronology. Rarer in the Namib are fossils of proboscideans (elephant relatives), aardvarks, bovids, (ruminants), equids (zebras) and carnivores (hyaenas, meerkats) but each occurrence yields information about palaeo-environments

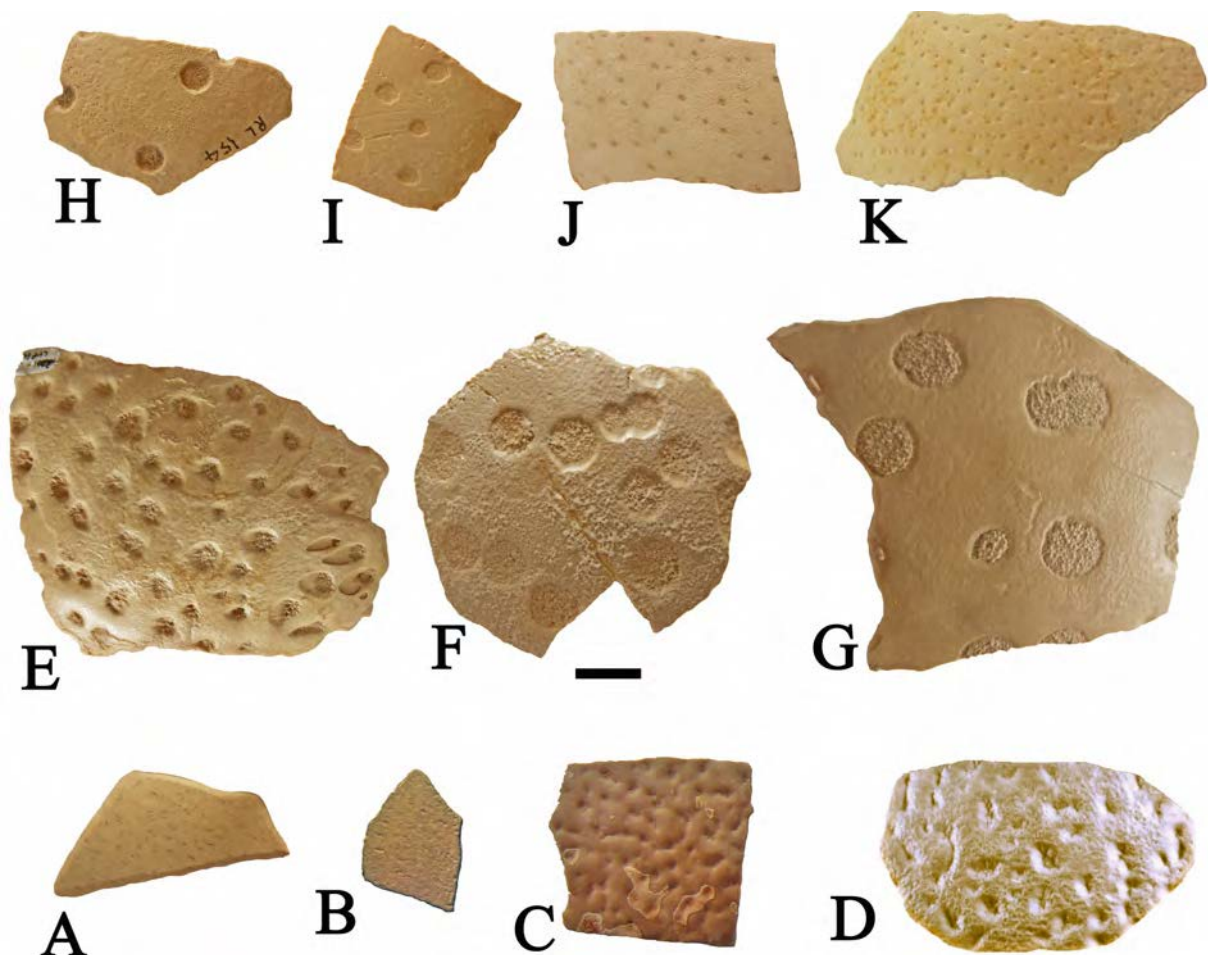



Figure 2.a.18: Succession of fossil ostrich eggshell types from the oldest (A) to the youngest (K). A. *Tsondabornis minor*, B. *Tsondabornis psammoides*, C. *Namornis elimensis*, D. *Namornis oshanai*, E. *Diamantornis corbetti*, F. *Diamantornis spaggiarii*, G. *Diamantornis wardi*, H. *Diamantornis laini*, I. *Struthio karingarabensis*, J. *Struthio daberansensis*, K. *Struthio camelus* Scale (under F fragment) 10 mm (Schneider)



and age. Thus the Kamberg Calcrete, which is widespread in the northern part of the Namib, can be dated to the Pleistocene on the basis of the equid and bovid fossils it contains, while they also indicate that there was an extended period of semi-aridity with over 250 mm of rainfall annually. The calcrete also contains stone tools, suggesting that humans were able to survive in the desert intermittently during these remote periods.

Fossil struthious (ostrich) eggshells, which are abundant in the aeolianites, are notable for the variation in shell thickness and surface morphology that they demonstrate. The fossil eggshells retain carbon and oxygen isotopes from when they were laid and this permits aspects of palaeoclimate and palaeo-ecology to be determined. Careful note of the stratigraphic context of the eggshells and their associated mammalian fossils has permitted the erection of a biostratigraphic scale based on eggshells. Some of the types of eggshells that occur in the Namib aeolianites have subsequently been reported from Malawi, Tanzania, Kenya and the United Arab Emirates and in every case the estimated age of the strata deduced in Namibia has been confirmed. The fact that the eggshells span the period 21 million years to the present is particularly useful, as they cover the entire history of the two Namib Sand Seas. Detailed mapping of the aeolianites is now possible using eggshells as a chronometric tool. Preliminary mapping reveals that the details of sedimentation are more complex than hitherto thought possible.

Thus far, little palaeontological research has been focussed on the Namib Sand Seas. The main areas studied have been Sossus Vlei, Tsondab Flats, Awasib and Meob, all of which are near the edges of the sand seas. Transects across the desert in the Uri-Hauchab area reveal that fossils probably occur throughout the desert, and it would be well worth spending more time and energy on a survey of the region because fossils hold the key for unravelling the detailed history of the Namib Desert and the Namib Sand Sea.



Figure 2.a.19: The Namib Sand Sea meets the southern Atlantic (van Schalkwyk)



2.a.3 VEGETATION OF THE NAMIB SAND SEA

By definition, desert ecosystems have very little vegetation cover and low net primary production, while hyper-arid deserts are almost devoid of any vegetation. The Namib Sand Sea is a particularly outstanding example of that universal truth.

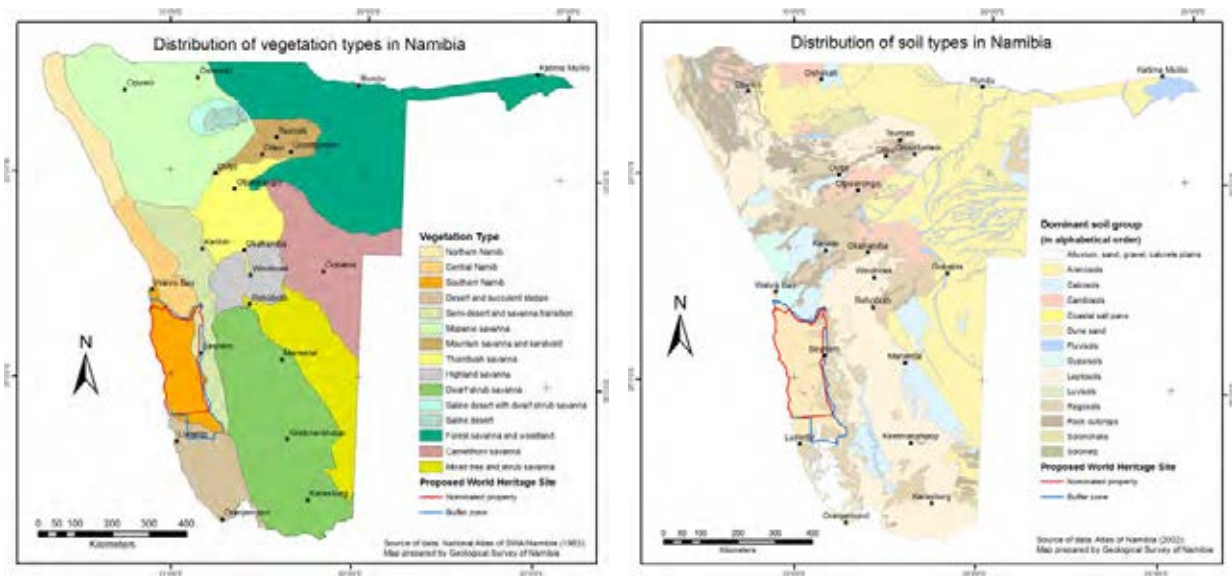


Figure 2.a.20: Vegetation and soil types of Namibia

However, early observations, suggesting that the southern Namib Sand Sea mainly consists of sand dunes without any important vegetation are deceptive, given the exceptional adaptations of plants in the Namib Sand Sea. The attributes of the vegetation cannot be adequately described by numbers of species alone (Annex 10; Table 2.a.1) but are particularly remarkable for their adaptations and patterns of growth (Annex 6). These adaptations allow the plants to steady themselves within unstable substrates, acquire nutrients in an environment with extremely low soil fertility, obtain moisture from a substratum with very limited water holding capacity (and little moisture input) or directly from fog, and withstand extreme thermal gradients in order to reproduce successfully and persist in harsh habitats. This is not to mention the challenge of attracting pollinator and disperser agents other than the wind from a limited a range of faunal species found in the Namib Sand Sea. Yet, these plant communities contain highly adapted plant species with regard to environmental sensitivity, life histories and physiology while displaying among the most intriguing forms of any biome. To persist in the harsh environment of the dune field, some plants have evolved to reduce the exposure of leaf areas to the sun and wind through rolled, water storing or exceptionally reduced leaves (xeromorphy). Belowground investments in an extensive lateral shallow root system to enable the plants to take advantage of surface moisture or, alternatively, deep taproots to enable the plants to access deep groundwater are other key adaptive strategies found in plants in the Namib Sand Sea.

Table 2.a.1: Plant species in the sand sea compared with the entire nominated area

Nominated area	Sand Sea
260 species	15 species





Offering habitats at the extreme end of aridity largely unaffected by climatologically drastic transformations and secluded from humans over millennia, the Namib Sand Sea shelters a variety of arid-adapted plant species. These thrive during unfavourable environmental conditions, largely unaffected by anthropogenic impacts, thus serving as a source for the restocking of affected areas upon amelioration of conditions. Moreover, the uniquely adapted flora of the Namib Sand Sea offers a rare and vast reservoir of remarkable hereditary plant traits that are potentially valuable for breeding new drought tolerant plant species and crop varieties in the face of the currently uncertain future of global warming. It is for this reason that the Namib has become a collection hotspot for the International Board for Plant Genetic Resources (IBPGR). Floristic communities on dunes and inselbergs within the Namib Sand Sea contain a matchless wealth of exclusive genetic material.

Nevertheless, the Namib dune ‘grasslands’ are quite simple compared to grasslands in moist climates where there is usually a succession involving various grasses as well as woody plants, and where subtle variations in soil chemistry and moisture can make the associations of species very complex. In



Figure 2.a.21: Vast grasslands on the eastern boundary of the Namib Sand Sea (Fennessy)

contrast, in the Namib Sand Sea there is a gradient of increasing rainfall from the coast inland towards the east, and this is reflected in a gradual rise in the number of species and the abundance of grassy and other vegetation on the dunes. A separate document on vegetation in the Namib Sand Sea by Kolberg can be found in Annex 6. A comprehensive list of all flora species occurring within the nominated Property is included in Annex 10.

Gradient west to east: For the Namib Sand Sea ecosystems, rain is not the only important source of moisture input. It is, of course, essential for seed germination. Fog and dew are, on the other hand, of great importance, particularly for ongoing growth. Fog in the Namib stretches for tens of kilometres inland on many mornings, and is at its densest at an elevation of 200 m to 600 m above sea level and 20 km to 60 km inland. Any obstacle that may be presented by plants, rocks and soil surfaces on the landscape causes fog-water to condense and form droplets. Frequently occurring and thus more predictable fog along the Namibian coastal shores, augmented by relatively high humidity directly on

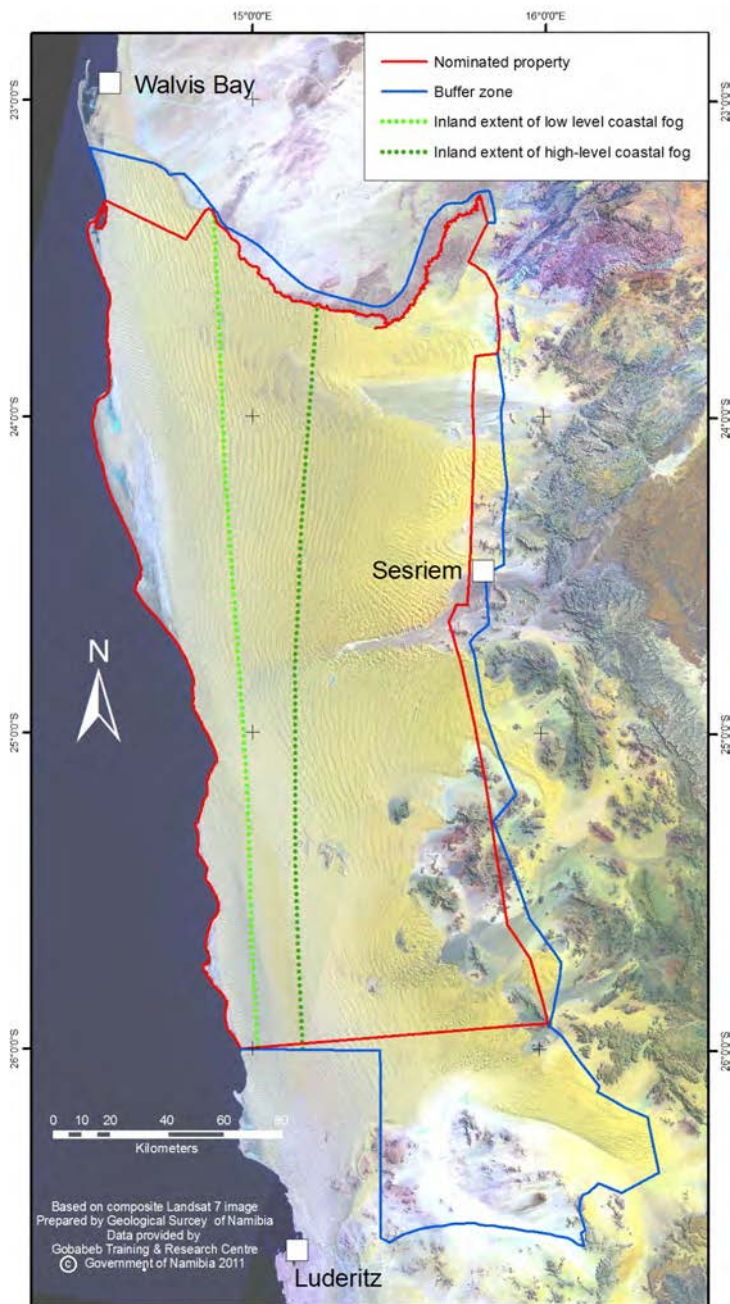


Figure 2.a.22: Estimated limits of fog over the Namib Sand Sea

the coast, is the lifeline of many plant and animal species in the harsh Namib Desert and a significant causal factor in the extraordinarily high diversity of animal life in this extremely arid environment. Whereas the mean annual rainfall along the coast ranges between 2 to 20 mm and is mainly restricted to the summer months, thick fog occurs on more than 100 days of the year delivering up to 1 litre/m²/day of fresh water with low osmolarity (low salt content).

Vegetation species distribution, abundance and density in the Namib Sand Sea mirror the gradient of decreasing fog and increasing rainfall from the coast inland towards the east. This is most evidently reflected in a gradual upsurge in the biomass and number of grassy vegetation species on the dunes. Near the coast, only two plant species occur as perennial species. The succulent *Trianthema hereroensis* and the coarse grass *Stipagrostis sabulicola* are able to survive in the erg and endure drawn out rainless periods by absorbing fog-water through their leaves and shallow roots respectively. *Trianthema hereroensis* soaks up fog-water directly via its leaves and stems and at the same time taps into moist subsoil layers with comparatively deep roots. In contrast, the extremely extensive rooting system

of *Stipagrostis sabulicola* is twofold. While shallow roots anchor the grass clump in the mobile sand, surface roots may cover distances of more than 20 m from the plant while extending no deeper than 5 cm. This configuration allows the grass to effectively harvest fog moisture condensing on the shallow roots. In addition, *Stipagrostis sabulicola* harvests fog-water on its firm upright stems and channels the droplets towards its anchoring roots just beneath the dune surface via stemflow. Nocturnal fog collecting on the grass may lead to disproportional wetting of the mound of sand around the plant, with an average-sized plant harvesting up to four litres of fog-water in one night. Moreover, heterogeneity of spatial soil water content may develop within a mound due to differential funnelling of fog drip by unevenly arranged stems and drooping V-shaped leaves.



Figure 2.a.23: *Stipagrostis sabulicola* and *Trianthema hereroensis*, two perennial plants reliably supporting a diverse animal life (Gobabeb Centre)



As plants that are endemic to the Namib Sand Sea and both dependent on fog in the western dunes, *T. hereroensis* and *S. sabulicola* have different eastern limits to their range. While the range of *T. hereroensis* extends about half way across the sand sea, *S. sabulicola* grows across the entire dune field to its inland periphery. Although growing most commonly on the more stable dune base in the west, *S. sabulicola* is restricted to the less stable areas near the dune crest in its eastern range. With the dune sand providing exceptional opportunities for burial of seeds and both plants regularly producing seeds, *T. hereroensis* doing so all year round, a well-stocked seed bank is ensured at all times even after long dry spells. With the advent of an exceptional rain, vegetation germinates across most of the dune expanse. However, a year or so later, the zonation of different species growing at different elevations on the dune is evident. The most likely determinant of the plants' distribution patterns and densities on the dunes is differential mortality rates related to availability of moisture



Figure 2.a.24: Grass gradient across a single dune (Gobabeb Centre)

over the short and longer term. Meanwhile, where *T. hereroensis* drops out of the mix, several additional grass and dicot species pick up.

Across one dune: Vegetation growth gradient across individual dunes is relatively complex. The uppermost parts are the driest, as expected, as this part is the most exposed and gravity drains water away from it. However, the dune base is also relatively dry, probably because of the



greater compaction of the sand and consequently greater runoff and less infiltration. So the mid-dune has the highest soil moisture and the greatest standing crop.


Variation across one dune in the western, transverse dunes and adjacent linear dunes is limited. The perennials, *Trianthema hereroensis* and *Stipagrostis sabulicola*, grow mainly on the dune slopes, or plinth, but also in the sandy interdunes. In contrast, *Cladoraphis spinosa*, which germinates profusely after exceptional rains, is limited to the interdune valleys. Remnants of this spiny, shrubby grass are visible for several years after a germination event.

Midway across the dune fields, travelling from west to east, the vegetation pattern on an individual dune shows more variation. The amount of living vegetation varies greatly depending on the time since the last good rain. *Trianthema hereroensis* and *Stipagrostis sabulicola* grow on the dune slope with *T. hereroensis* more common on the lower slope and *S. sabulicola* higher up. Soon after good rains, *Cladoraphis spinosa*, which is so common on the sandy interdunes to the west, grows sparsely on the lower edge of the plinth. *Centropodia glauca* with its high protein content and often *S. leutescens* grow densely along the lower dune slope while spiny *Stipagrostis seelyae* dominates the middle part of the dune slope. The interdune, which is often composed of gravel rather than sand midway across the dunes, supports an almost uniform cover of the primarily annual *Stipagrostis gonatostachys*, with *S. ciliata* growing only on the interdune at the edge of the dunes where moisture is slightly more available. On the relatively stable coarse ripple sand of the eastern, but not the western, dune base, the leaves of *Monsonia ignorata* emerge from their corms buried 10-20 cm beneath the surface. Scattered occasionally along the dune base, individuals of the *Hexacyrtis dickiana* lily emerge and a few of them find enough moisture to produce spectacular mauve flowers. *Sesamum abbreviatum* may occasionally stand proud and flower on the lower dune.



Figure 2.a.25: Dune grasses: *Centropodia glauca*, *Stipagrostis leutescens* and *Cladoraphis spinosa* (Gobabeb Centre)

Travelling even further east, the linear dunes and the high star dunes become more vegetated. *Trianthema hereroensis* drops out of the array but *Stipagrostis leutescens* and *S. seelyae* insert themselves on the lower and middle dune slope and the high protein, nutritious *Centropodia glauca* grows at the dune base. Interspersed among the primarily grassy flora, the dicots, *Hermannia minimifolia* and *Limeum fenestratum*, grow on the lower dune slopes as well. At a certain point the



diversity peaks and then decreases as the eastern dunes are lower and perhaps two dune grass species are found with another two or three grass species on the bordering plains. At isolated spots where Tsondab Sandstone is exposed between the eastern dunes, *Stipagrostis pellytronis* is occasionally found growing on this substrate.

Five of the common dune species are strictly endemic to the Namib Sand Sea, while others extend to sand-covered areas further north or south beyond this central area. The endemic species include the grasses *Stipagrostis pellytronis* and *Stipagrostis seelyae* and the dicots *Hermannia minimifolia*, *Sesamum abbreviatum* and *Monsonia ignorata*.

Grass as support to fauna: Other than revealing transformations in the distribution patterns of vegetation across the erg correlated with the rainfall gradient, grass cover also patches up the uneven spread of plant cover that normally characterizes the ecosystem, allowing animals to disperse and broaden their home and foraging ranges. Being the most widely distributed and abundant vegetation type, grasses in the Namib Sand Sea, just as in grassland savannas, provide the greatest proportion of net primary production and food at the base of the ecological pyramid. Despite an almost immediate explosion in plant biomass due to the sprouting of grasses and other vegetation after significant rains, accompanied by heightened animal activities, the response varies from habitat to habitat. The remarkable jolt of available energy in the ecosystem after rains attests to the fact that plant growth in the Namib Sand Sea is very dynamic and that water is the most important limiting factor. Sufficient rainfall acts as the catalyst for *en masse* germination of countless seeds in the erg, but it takes sustained moisture input from fog to allow successful growth and establishment of plants



Figure 2.a.26: Breeding male ostrich taking advantage of abundant grass (Gobabeb Centre)

where rainfall is limited in the western Namib Sand Sea. Additional to water, other factors such as nutrient supply, especially nitrogen and phosphorus, as well as physical stability of the sandy substrate may impose limitations on the establishment of plants in certain localities of the erg.

The two hardy iconic plants inhabiting the western dunes, *Trianthema hereroensis* and *Stipagrostis sabulicola*, although relatively sparse, are essential support for a variety of dune fauna. The succulent, *T. hereroensis*, an evergreen desert plant, flowers and produces seeds throughout the year providing shelter and food to a large diversity of animals in the Namib Sand Sea including gerbils, sparrowlarks, scale insects, ants, tenebrionid beetles, ostriches and oryx (gemsbok). An outstanding trait of this endemic plant of the Namib erg is its ability to vigorously re-grow and replace shoots eaten by oryx, the only



large herbivore commonly found in the western sand sea. The larger lush new leaves serve to continually draw the gemsbok back to the same succulent bushes. Similarly, the bushman grass *S. sabulicola* is an endemic of the Namib dunes sheltering a host of organisms such as beetles, reptiles, gerbils, ants and lizards while also being grazed by oryx when other food is limited. Both perennial plant species perform as opulent isolated islands supporting a myriad of diverse invertebrates and vertebrates in the otherwise sparsely inhabited sand sea.



Figure 2.a.27: Distinctive substrate ecotone between dune and interdune supports different *Stipagrostis* and other sand sea grasses (Gobabeb Centre)

The dune base may support its own distinctive flora and fauna that is discretely dissimilar from the plant assemblages and animal species found higher up on the same sand dune. The area above the dune base is slopes at about 14° relative to the horizontal plain and is known as the dune slope. The dune slope may be subdivided into a lower more vegetated section commonly referred to as the 'plinth' and an upper slope. As with the dune base, the dune slope including the plinth supports unique distinguishing life forms. The steepest portion of the

dune that is inclined at about 34° and represents less than 1% of the total dune surface area is known as the 'slipface'. The slipface is of essential and outstanding value to the Namib Sand Sea in that it is home to many endemic fauna (fauna only found in the Namib Sand Sea). These animals feed on windblown detritus, predominantly of plant origin, which accumulates there on a daily basis distributed by the wind. Life in the dune field is profuse on dune slipfaces inhabited by the scores of beetles, fish moths and lizards careering over the loose sand when temperatures and winds favour foraging.

!Nara: Although common along water courses, !nara plants (*Acanthosicyos horridus*) frequently become the keystone species in the Namib Sand Sea, often being the only plants in an area. A very long-lasting melon-bearing bush, !nara is endemic to the coastal regions of Namibia and southern Angola, essentially the Namib Desert. The !nara traps windblown sand to form giant sand hummocks of considerable height, but always manages to grow and emerge above the dunes with its knotted leafless branches. It has longitudinally ridged stems with arching branches and paired spines of 2-3 cm length, all of which are pale green to



Figure 2.a.28: The endemic *Acanthoproctus diadematus* at home in the spiny leafless cucurbit !nara (Gobabeb Centre)



greyish-green in colour, thus enabling the plant stems to photosynthesise. Absence of foliar growth is a consummate water conserving adaptation to the hyper-aridity of the plant's distribution range. The !nara plant has a thick deep taproot that can extend 40 m or more into the sandy subsoil to facilitate tapping of groundwater near ephemeral rivers and their palaeo-channels within the Namib Sand Sea. As a dioecious plant, only females bear the hard coated, spherical spiny melons that start off as green fruits before turning yellow as they ripen. The fruit reaches diameters of 15 cm and hold a copious creamy pulp surrounding numerous pips.



Figure 2.a.29: !nara hummocks produce nutritious melons enjoyed by animals and people alike (Gobabeb Centre)

Inside the hard covers of !nara seeds, the protein- and oil-rich endosperm with a high content of unsaturated fatty acids has provided nutrition for desert dwellers over the millennia. Today, people eat the seeds raw or roasted as nuts or they are added to other dishes after pounding. Pulp of the !nara fruits is also consumed as dried fruit or mixed with other dishes such as porridge. Currently the Topnaar (Nama) indigenous community along the Kuiseb River harvests the fruits, mainly to market the seeds in nearby towns. They are turned into !nara-seed oil or sold as roasted, salted snacks to be enjoyed far beyond their source in the Namib Sand Sea.

Other than humans, the !nara plant also supports a number of animals by providing them with moisture and nutrition and even shelter for the small-sized ones. The hardened barbed mature stems of the !nara, aided by its entwined growth form, offer effectual security against herbivory. However, young, tender and succulent shoots and buds form an important source of moisture and sustenance for ostriches and lizards, whereas the fruits are opened up and eaten by gemsbok and black-backed jackals. The seeds, once the harder outer shell of the melon is broken, are eaten by a number of smaller mammals such as gerbils and mice.

Inselbergs: Isolated peaks are a global feature of all desert landscapes and these mountain islands or inselbergs are universally known to be havens for uncommon, often endemic species of plants and animals in a particular area. The morphological features of the constituent granite rocks forming inselbergs in the southern part of the Namib Sand Sea give rise to various habitat types on the outcrops in the crevices, depressions, cracks and at the foot of the hills. Within the Namib Sand Sea, the isolated inselbergs integrate two facets, namely the exceedingly long time of disconnection from the Great Western Escarpment to the east and the physical blockade from comparable habitats by mobile sand dunes.



Figure 2.a.30: *Hoodia currori* adding colour to the eastern plains surrounding the inselbergs (Gobabeb Centre)

The Hauchab chain of mountains within the Namib Sand Sea (25°20'S; 15°15'E) at 50 km from the lowest hills of the Great Western Escarpment and 30 km from the nearest comparable habitats within the erg are possibly the most isolated inselbergs in the entire Namib Sand Sea contributing to preserving their unspoiled natural character. Moreover, the locality of the Hauchab group of inselbergs, flanked by tropical and temperate vegetation zones in southern Africa, position them as potential refugia for flora from contrasting bioregions.

Inselbergs occur within the same rainfall range as the rest of the Namib Sand Sea but may receive relatively higher precipitation than the lower lying sand dunes surrounding them. This is thought to be due to the transfer of heat when warm air is forced to ascend the hills, leading to condensation and cloud formation. Other than convective rainfall mainly during summer, protuberance of the inselbergs from the erg landscape place them directly in the path of inland-swept fog from the ocean. As fog occurs all year round, the inselbergs consequently intercept some of this moisture, even though the frequency of fog diminishes further east.

By receiving more rainfall and catching additional fog, inselbergs have a comparatively wetter local climate than the rest of the Namib Sand Sea. This moisture is further augmented by a degree of influence from a winter rainfall climate characterised by high air humidity and mild ambient temperatures. The result is relatively abundant and diverse vegetation species composition and far greater net primary productivity in some micro-habitats of the inselbergs than on sand dunes. For an example of the diversity, the Hauchab series of inselbergs hosts a combination of species from both the palaeotropical Nama Karoo (72%) and temperate Succulent Karoo (26%) of the Greater Cape Flora. They thus feature taxonomic characteristics of the Namib Sand Sea as well as a wide range of southern Namib rocky habitats. Increased runoff from the smooth rock surface channels water to the foothills of inselbergs and thus supports more plant species around the bases.



Figure 2.a.31: *Hoodia pedicellata* nestled between rocks on a Namib inselberg (Gobabeb Centre)

No endemic plant species are found specifically in the Hauchab inselbergs. This is probably due to efficient and long-range dispersal by the strong easterly, southerly and westerly winds in the Namib



Sand Sea. In fact close to two-thirds of plant species found in the Hauchab archipelago are dispersed by wind, compared to only two-fifths of species found nearby on the Great Western Escarpment.



Figure 2.a.32: *Commiphora saxicola* breaking through its rocky constraints (Gobabeb Centre)

Seeds of 80% of the species, for which the area constitutes a distributional limit, are mainly wind dispersed. It is a particularly outstanding aspect that the inselbergs constitute the most extreme distributional range and disjointed occurrence for a high percentage of the species in the area. This is best demonstrated by *Hoodia ruschii* with the nearest population of this species 150 km away from the Hauchab area.

The most abundant plant species, mainly succulents, on and around foothills of inselbergs include among others: *Mesembryanthemum guerichianum* and *Sarcocaulon marlothii*. Some other succulent plant species, *Aloe asperifolia*, *Hereroa puttkamerana*, *Trichocaulon pedicellatum* and *Sesuvium sesuvioides*, are exclusively found in the crevices and cracks on the mountains.

Riparian vegetation: The ephemeral water courses flowing into the erg form oases sparsely marked by trees that nevertheless support a diversity of vegetation types within and on the edge of the Namib Sand Sea. Large quantities of pods, fruits and seeds are washed down the rivers from the interior of the country towards the Namib Sand Sea where they germinate to augment the floristic composition of river valleys within the erg. The flow of subsurface water in both the active and palaeo-channels of the watercourses recharges the



Figure 2.a.33: Bright pods and flowers of *Adenolopus pechuelii* add colour to dry washes and inselbergs alike (Gobabeb Centre)



Figure 2.a.34: Spiky *Blepharis obmitrata* releases its seeds slowly over several seasons (Gobabeb Centre)

water supply and supports the riparian vegetation. However, the force of flood water does not allow the establishment of vegetation within active river channels as trees and perennials are frequently uprooted and washed away.

Deterministic factors of species composition for plants in a specific segment of the riverbed include the points of flood origin and termination. This relates to where the seeds were picked up in the upper catchment and redeposited by floodwater as well as the duration of floods, which governs the volume and depth of moisture recharge in the soil. The roots of seedlings germinating and establishing in the riverbed need sufficient availability and access to moisture to develop fully into saplings. In this regard, the presence of suitable niches for germinating seedlings and water holding capacity of the soil in which they germinate

along with the herbivory pressure from game all may exert a very strong selective force on the successful recruitment of plant species into the riparian community along ephemeral water courses flowing into the Namib Sand Sea.

The number of plant species growing along the ephemeral rivers ending in the Namib Sand Sea decreases towards the west, reflecting diminishing flood volumes, and varies from river to river and year to year. Most common is the camelthorn, *Acacia erioloba*, Namibia's national tree. Other tree species may include, amongst others, *Maerua schinzii*, *Euclea pseudebenus*, *Ficus sycomorus*, *Tamarix usneoides* and *Salvadora persica*. Vegetation communities on the banks of river channels directly over the high water mark, commonly include *inter alia*, the shrubs *Adenolobus pechuelli* and *garipensis* with an understorey comprising the devil's thorn weed *Tribulus terrestris* and *zeyheri* and aliens, wild tobacco *Nicotiana glauca*, castor bean *Ricinus communis*, thorn apple *Datura stramonium* and the Mexican poppy *Argemone ochroleuca*. Within the endpoints of the rivers, *Salsola tuberculata* is common, particularly at Tsondab Vlei. The herbaceous layer on the banks of ephemeral rivers may also include *Sesuvium sesuoides*, *Zygophyllum simplex*, *Indigofera auricoma*, *Mesembryanthemum guerichianum* (ice plant), the spiny *Cladoraphis spinosa* (ostrich grass), and dense stands of the bitter bush *Pechuel-Loeschea leubnitziae*.

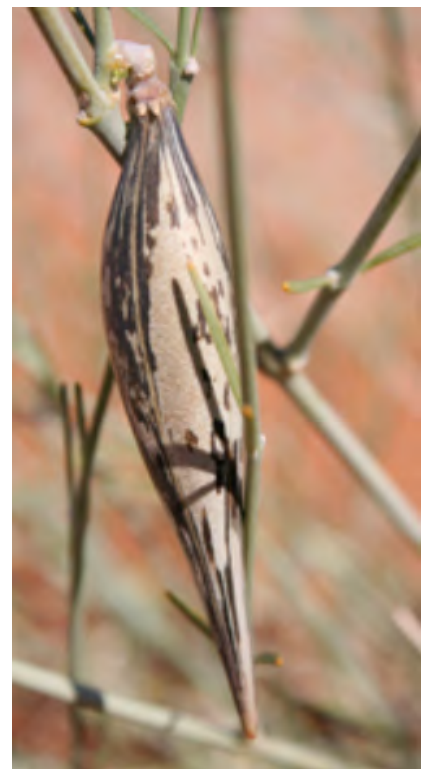


Figure 2.a.35: Inhabiting dry water courses, *Orphanthera albida*, is pollinated by moths and the wind disperses its seeds bit by bit (Gobabeb Centre)



Riverine trees and shrubs growing in ephemeral rivers represent a 'linear oasis' through the Namib Sand Sea. Their role as a linear oasis varies widely depending on the lushness of the riparian vegetation they support. Larger trees provide nesting sites for vultures, birds of prey and other species. Smaller trees and shrubs harbour the smaller nesting birds. These smaller trees and shrubs



Figure 2.a.36: The presence of *Maerua schinzii* and *Acacia reficiens* reveal shallow water courses in the eastern plains (Gobabeb Centre)


tend to accumulate sand around their base and this provides a habitat for numerous small mammals, either digging into the ground or simply hiding in the shade and shelter provided. Invertebrates are also attracted to the vegetation of the linear oases. A study of the insect fauna of the lower Kuiseb River on the northern boundary of the Namib Sand Sea revealed 15 orders of 161 families and 719 species. In contrast to the sand sea, the fauna of the linear oases is almost totally non-endemic and widely distributed.

Acacia erioloba, a slow-growing hardwood tree renowned for its hardiness and longevity that occurs along river courses and pans and as 'islands' in the dune landscape, is a key element of the ecology along the eastern parts of the Property. It is the major nesting habitat for birds, from tiny pearlspotted owls *Glaucidium perlatum* occupying knot-holes, to the large nests of raptors and vultures. The communal nests of sociable weavers, *Philetarius socius*, resembling suspended haystacks, are a particularly spectacular example of bird nesting. These nests are habitats in themselves, hosting raptors, bats, large snakes, specialised nidicoles, and a whole host of invertebrates.

During the midday heat the spreading tree canopies offer welcome refuge to almost all fauna,



Figure 2.a.37: Versatile *Acacia erioloba* provides welcoming shade on dunes as well as in ephemeral water courses (Gobabeb Centre)



with herds of springbok, oryx or ostrich congregating under their shade. These animals contribute to the relative importance of *A. erioloba* trees by concentrating nutrient-rich dung patches under the trees. These visitors are also host to swarming multitudes of the near-endemic tapan species *Ornithodoros savignyi*. These soft-bodied ticks are adapted to feed only briefly, injecting salivary compounds that inhibit blood coagulation which may be fatal to non-native species. They soon drop off and bury themselves again between all the other soil fauna inhabiting the permanent shade under the trees. Of course, camelthorns also provides abundant browse, leaf litter, and nutritious seedpods that sustain complex consumer foodwebs, thus its recognition as providing extraordinary biodiverse habitat islands in the eastern Namib Sand Sea.

An unexpected consequence of these hardy trees growing at the pans and end-points of ephemeral rivers deep in the Namib Sand Sea, combined with the almost total absence of organisms with the ability to destroy hardwood, e.g. bacteria, fungi, and wood-feeding insects, is the skeletal remains of long-dead trees in areas where they were able to germinate and flourish in the past. Fossil stands of trees occur at the popular tourist destination at Dead Vlei, adjacent to the current Sossus Vlei, and at scattered locations elsewhere, e.g. abandoned end-points of the Tsondab River at Tsondabvlei. These dead trees are mute testimony to the dynamic changes imposed on rivers by the encroaching dunes. Apart from providing opportunities for spectacular photographs by amateurs and professional artists alike, they also provide information about past discharge volumes and changes in river courses. Carbon dating of some fossil tree stands indicated that camelthorns may grow for more than 250 years, while recharge to the sites where they occur was abruptly abandoned some 600 years and 300 years ago at Dead Vlei (Tsauchab River) and Tsondabvlei (Tsondab River) respectively. The results confirm the potential of camelthorns to contribute to more detailed palaeoclimatic reconstruction in the Namib Sand Sea.



Figure 2.a.38: Sparse *Stipagrostis sabulicola* in a dry decade (Gobabeb Centre)

2.a.4 NAMIB SAND SEA FAUNA

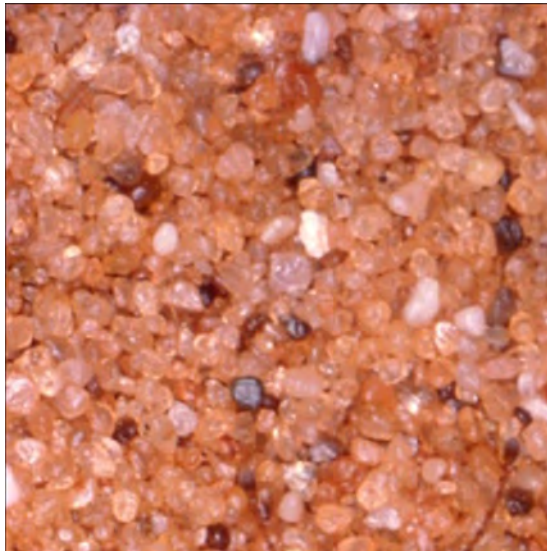


Figure 2.a.39: Air permeates the spaces between the sand grains (Gobabeb Centre)

Under a microscope, the dynamic windblown sand particles of the slipfaces and elsewhere in the Namib Sand Sea look like magnificent coloured marbles: hard, brilliant, irregular spheres with air trapped between them. Because the sparkling particles are so small, roundish, and hard, the sand flows like a liquid. The texture of the Namib sand, almost devoid of silt and clay particles, is believed to be one of the ecological determinants that resulted in the extraordinary endemism of the Namib Sand Sea fauna. Despite popular belief, the overall diversity of organisms in the entire Namib Desert is comparable to that of any other desert. However, what distinguishes the Namib Sand Sea is the diversity of hyper and ultra psammophilous species as well as the level of endemism (Table 2.a.2).

Animals in the Namib Sand Sea, unlike similar animal species in other dune deserts that have to dig burrows, can literally swim smoothly through the sand. Because they can rapidly dive into the sand and immediately disappear, the animals have access to a thermal haven wherever they are on slipface or dune slope surface. By swimming down to a depth of about 300 mm, they can reach a comfortable temperature, which does not vary between day and night, and varies only about 10°C between summer and winter. So slipface-dwelling animals can stay active on the surface during the day until the last moment, and then swiftly escape the hot sand and burning sun. A similar mechanism can be used on the dune slopes, although the sand is more compacted there and the 'swimming' takes a bit more effort and time. On the other hand, nocturnal animals can use the warmth of the sand to escape the cold nights too, and both diurnal and nocturnal animals can dive to avoid predators.

The animals could not use these amazing thermal havens, or the refugia safe from predators beneath the sand, if they could not breathe below the surface. The air trapped between the particles of small, roundish, hard sand grains, even half a metre below the surface, is almost as pure as surface air. No one knows how long it has taken the air to diffuse down into the sand. It is not replaced quickly if used up. However, by moving around even slightly amongst the granules under the sand surface, which the 'swimmers' can do by lateral



Figure 2.a.40: An endemic tenebrionid beetle *Zophosis fairmairei* diving into the sand (Gobabeb Centre)

swimming, the animals can find a sufficient supply of pure, life-sustaining air wherever they are in their sandy habitat.



Figure 2.a.41: *Lepidochora discoidalis*, endemic tenebrionid beetles, foraging on wind-blown detritus in the evening (Gobabeb Centre)

The animals which seem to benefit most from the spectacularly unique properties of the Namib sand particles are invertebrates. Many species of beetle can forage for long periods on the sand surface during the day because they can escape so easily if and when they get hot – or predators appear. However, much larger animals can use sand swimming locomotion too. Lizards can fold their forelegs against their bodies and writhe through the sand using powerful abdominal muscles and their tails. As reptiles, lizards have low metabolic rates, so their sub-surface swimming and ability to live below the sand is not as surprising as that of an insectivorous mammal, the Namib golden mole *Eremitalpa granti namibensis*. This blind voracious ball of fluff, except for nocturnal surface sorties, spends its life below the surface of the Namib Sand Sea. The mouse-size mole uses its spade-like

forelimbs, extraordinarily powerful for an animal of its size, to paddle through the sand, down to a depth of 1 m. Unlike most ordinary mammal species, it is a poikilotherm – its temperature varies with its environment just like a reptile – which helps it match its metabolic rate to the oxygen levels in the unique, well oxygenated Namib sand.

The extraordinary conditions supporting life beneath the dunes, combined with the frequent fogs bringing moisture to the fauna and flora, represent much of the foundation of the astonishing environment afforded by the Namib Sand Sea. As a consequence, animals living in the Namib Dune Sea have adapted to all the various habitats presented by this diverse landscape (Table 2.a.2).

Although some take advantage of the surface, a vast majority has found some way to live part or all of the time in the extraordinary conditions available beneath the sand surface.

Table 2.a.2: Species richness and endemism in the sand sea (84% of the Property)

	Plants	Arachnids	Insects	Reptiles	Mammals	Birds
Sand sea spp.	15	44	207	18	12	9
Endemic spp.	8	37	108	8	2	1
% Endemism	53%	84%	52%	44%	17%	11%

As this document only focuses on some of the fauna occurring in and/or frequenting the Namib Sand Sea, full animal species lists known to occur in the Property have been included in Annex 11 to 18 respectively: invertebrates and protista (Annex 11); arachnids (Annex 12); insects (Annex 13); fish, amphibians and reptiles (Annex 14); mammals (Annex 15), birds (Annex 16), Sandwich Harbour



Ramsar site birds (Annex 17) and a summary list of sand sea inhabitants and endemics extracted from those annexes (Annex 18).

Evolution, endemism and sand: The large number of sand sea endemics with their specialised adaptations to live in sand, which does not allow them to successfully colonise any other habitat except unconsolidated sand, are labelled ‘ultrapsammophilous’ and ‘hyperpsammophilous’. This refers to the fact that they are restricted to sand primarily through their evolution of morphological

Distribution of *Trianthema* spp. in the Namib Sand Sea

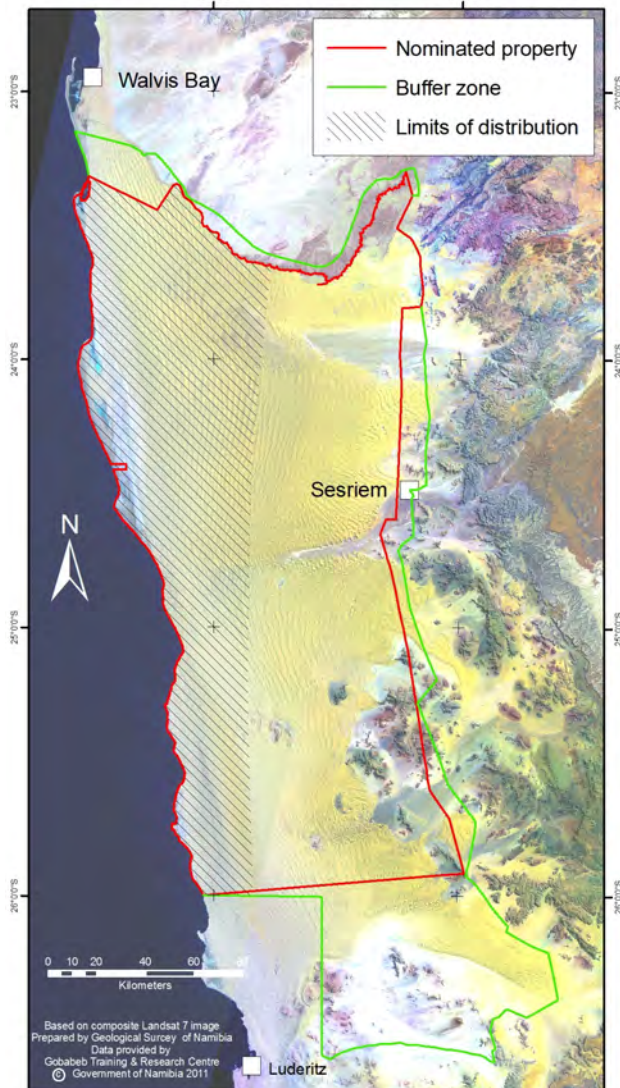



Figure 2.a.42: *Trianthema hereroensis* distribution is closely linked to the inland boundary of coastal fog. Endemic fauna are more mobile, but in various groups closely related coastal and inland species or subspecies have evolved (Gobabeb Centre)

and behavioural attributes such as specialised structures for movement (feet, musculature, external features of feet and other extremities, body shape, and resistance to abrasion). These species, which include spiders, scorpions, diverse insects, reptiles and mammals colonise new habitats by migrating within fast moving barchan dunes along windswept corridors or stretches of unconsolidated hummock dunes where slipfaces are common. This distinguishes the Namib endemics from other species that merely inhabit and prefer sandy substrates (psammophiles). Ultrapsammophilous species are unable to live in any other habitat other than unconsolidated sand of slipfaces. Hyperpsammophilous species only occur in habitats where unconsolidated sand is a feature of the sandy substrate and grass-covered dunes. A more detailed overview of the ecology and evolutionary processes of the Namib Sand Sea can be found in Annex 5.

Two suites of Namib Sand Sea fauna can be biogeographically distinguished – a coastal suite and an inland or eastern component. However, separations between the distribution limits of closely related endemics are relatively fluid and often have considerable overlap. Range limits also vary considerably between different sets of species, mostly within evolutionary lineages, where coastal and inland representatives can be distinguished. This biogeographical attribute became apparent when inventorying showed that endemics from the inland parts of the Namib Sand Sea are always absent from the coast. The opposite, however, is not true as



predominantly coastal species may range far into the interior on dune crests and slipfaces, often occurring sympatrically with their habitat equivalents towards the east. Generalized zoogeographical zonation of the Namib Sand Sea is therefore not feasible.

A small number of Namib Sand Sea endemics are only found towards the north in the fog-dominated coastal zone, but do not occur in the seemingly similar sand sea habitat in the south. They probably reflect evolutionary processes, though the past genetic barriers that may have resulted in speciation, or the factors that prevent those species from migrating south is not yet clear. It has been shown that some Namib endemics migrate within fast-moving barchan dunes, i.e. their habitat migrates while they remain stationary, which suggests that the dominant onshore wind may have a biogeographic effect. Along the eastern Namib Sand Sea, which historically has been more accessible for research, the sand sea habitat is relatively homogenous with no latitudinal gradients in Namib Sand Sea endemics. Some species occurring only in the southernmost part of the Namib Sand Sea are, however, endemic to dune habitats in the winter-rainfall Succulent Karoo Biome further south.




Figure 2.a.43: *Hadogenes* scorpions that live in narrow cracks, are some of the 'living fossil' populations that survive on inselbergs surrounded by dunes (Gobabeb Centre)

The inselbergs and eastern rocky habitats of the Namib Sand Sea have a biogeographic role as both phylogenetic and geographical relict species have been recorded from those isolated habitats. In the case of phylogenetic relicts, or 'living fossils', the lineages they represent are extinct elsewhere in southern Africa or the continent. Although not endemic to the Namib Sand Sea, relict species at refugia within the nominated Property are an important component, as the relative

isolation of these habitats shields them from more successful competitors. Similar to the phylogenetic relicts, geographic relicts occurring on the inselbergs and eastern rocky habitats are also not endemic to the Namib Sand Sea, but more widely distributed in mountainous habitat towards the north and along the Western Escarpment. The known populations of these species represent geographic isolation resulting from regional climatic changes. Molecular phylogeographic research on relict populations of several species that became geographically isolated in the past, now living immediately adjacent to the Namib Sand Sea, have proved their importance for understanding how populations that became isolated through climatic changes may survive.

The evolutionary adaptations that resulted in the endemism and specialised diversity of the Namib Sand Sea are exceptionally clear. The range of Namib Sand Sea endemics furthermore offers some of the clearest known examples of progressive evolution in very different lineages of closely related species. Natural selection of specific attributes that would clearly benefit populations under the specific environmental attributes of the Namib Sand Sea, which demonstrably has led to speciation,



can be readily identified. The evolutionary ancestors of the Namib Sand Sea endemic lineages are still present in the region, which allows reconstruction of likely evolutionary pathways. Phylogenetic reconstruction of evolutionary relationships between endemic species in such diverse groups as reptiles, fishmoths, *Comicus* dune crickets, flightless *Scarabaeus* dung beetles, and a range of tenebrionid beetle genera (e.g. *Brinckia*, *Lepidochora*, *Onymacris*, *Zophosis*) has repeatedly shown similar results.

There are clear south to north evolutionary trends in specialist species inhabiting the dune fields of the greater Namib Desert, and specifically the Namib Sand Sea. This confirms the biogeographical and evolutionary consequence of the dominant unidirectional wind regime, though the particular attributes differentiated are not related to wind itself. Within the Namib Sand Sea, from south to north, the more plesiomorphic (or ancestral) species of endemic lineages occur in the southern coastal areas towards Lüderitz, with more derived (or apomorphic) species occurring further north towards the Conception Bay and Sandwich Harbour areas. Similarly, from west to east, multiple evolutionary terminations are derived from coastal species (or subspecies) leading to close derivatives towards the interior. This latter pattern also indicates the significance of reduced access to fog moisture in the evolution of Namib Sand Sea endemics and the subsequent distribution of species.



Figure 2.a.44: *Comicus* crickets belong to a relict fauna of the Gondwana palaeo-continent. Reconstruction of the evolution of *Comicus* species indicates that it is one of several unrelated sand sea endemic lineages that show northwards succession of derived features (Gobabeb Centre)

Most of the evolutionary phylogenetic reconstructions to date have been based on comparative morphology, though exploratory molecular analysis has confirmed very similar trends. As can be expected, speciation trends based upon morphological comparison cannot explain the exceptional physiological and behavioural adaptations of the Namib Sand Sea endemics. Morphology also does not show possible northwards speciation trends in dunes along the eastern margin of the sand sea. Unpublished molecular analyses indicate, however, that the observed trend for populations of coastal species to range far into the interior may relate to the genetic diversity of those species, while distinct differences may occur between different populations in species of the interior. Similarly, the exploratory research indicates that molecular genetics may explain the evolutionary ancestry of some of the behavioural and physiological characteristics in Namib Sand Sea endemics. Molecular research methodologies have yet to be applied more widely to evolutionary and biogeographical analysis of the Namib Sand Sea although they hold promise to explain how the Namib Sand Sea's extraordinary degree of endemism, which is so different from most other deserts, has evolved.





Overall, the fauna of the dune system is typically desertic and is composed almost entirely of insects (Table 2.a.3), arachnids and reptiles with only a few unique birds and mammals venturing into this inhospitable landscape for any length of time. Similar to the vegetation, the fauna of the Namib Sand Sea cannot be described by numbers of species alone – although these are not inconsiderable. Instead, it is a matter of astonishing adaptations to the array of habitats and their extraordinary characteristics. Although certain important morphological adaptations are exhibited by some of these animals, particularly to locomotion and life in a sandy medium, the more remarkable adaptations are of a behavioural and physiological nature. The descriptions below highlight just a few of the astonishing animals inhabiting the Namib Sand Sea and their amazing characteristics.

Table 2.a.3: Insect species richness in the Namib Sand Sea (from Annex 13)

Nominated area	Exotics (aliens)	Desert endemics (excluding dunes)	Sand sea species	Sand sea endemics	% Sand sea endemicy
1388	8	92	207	108	52%

Detritivores: Yet another remarkable aspect of the Namib Sand Sea is the number of animals that consume wind-blown detritus – seeds, bits of dry plants, fragments of dead invertebrates - as their main or only source of energy. Their contribution to the ecological dynamics of the Namib Sand Sea is truly amazing. In essence, the animals involved in eating wind-blown detritus – beetles, termites, lizards – are largely catalysts of decomposition. They control the rate at which this dried organic matter is eaten and fragment it into smaller pieces. However, it is actually the micro-organisms in the detritivores’ guts that truly do the decomposing, and it is they that direct the flow of energy and nutrients through this arid, wind-swept, dry fluvial ecosystem.

Gut microbes live in and maintain a relatively stable environment of regulated temperature, pH and moisture. Therefore while it is true that decomposition by free-living microbes in desert sand and litter is probably limited and extremely erratic, there is fairly continuous decomposition going on in the guts of detritivorous insects. The ‘gut ecosystem’ helps to process compounds that are typically difficult to break down because of their chemical complexity, such as cellulose (the tough part of most plant tissue) in the remains of desert plants swirling around the dune habitats.

Tenebrionid beetles: The high diversity of endemic tenebrionid beetles has always been one of the spectacular attributes specific to the Namib Sand Sea within the broader desert environment (Table



Figure 2.a.45: The endemic tenebrionid beetle *Calognathus chevrolati* is an unusual global example of a detritivore that evolved into a predator (Gobabeb Centre)

2.a.4). Over 90 species of endemic tenebrionid beetles are to be found in the Namib, with at least half of them restricted to the matchless habitat provided by the sand dunes. They are almost all detritivores – consuming wind-blown detritus – in some way gaining their moisture from the Namib fog. The remarkable exception to the rule is *Calognathus chevrolati*, an endemic tenebrionid beetle that has evolved into a predator. These ubiquitous beetles are joined by a variety of other endemic invertebrates ranging from dung beetles, solifuges and fishmoths to termites, spiders and weevils.

Table 2.a.4: Tenebrionidae (Coleoptera) species richness in the Namib Sand Sea (from Annex 13)

Nominated area	Exotics (aliens)	Desert endemics (excluding dunes)	Sand sea species	Sand sea endemics	% Sand sea endemism
131	0	44	61	50	82%

Tenebrionid beetles are a diverse group of insects characterised by being flightless with fused elytra. Most in the Namib Sand Sea are active during the daytime although avoiding the hot midday sun; a few are crepuscular to nocturnal. Some are fast runners, e.g the endemic *Onymacris plana*, moving at more than 85 cm per second and, at the same time, experiencing exercise-induced cooling under high radiation in the Namib. Others emerge from beneath the sand surface to take advantage, in various ways, of the moisture bearing fog winds of early morning. One species, the endemic *Onymacris unguicularis*, may take up to 40% of its body weight in one foggy event. Many actively forage on the



Figure 2.a.46: Only a few sand sea endemics such as *Onymacris plana* tenebrionid beetles have adapted to being active towards the middle of the day when surface temperatures are lethally hot (Gobabeb Centre)

slipfaces in the afternoon as wind-blown detritus swirls over the steeply inclined sand surface. A few, e.g. the endemic *Onymacris laeviceps*, climb up onto the flowering grass stems to feed on pollen and fresh seeds. Other adaptations to the Namib Sand Sea include production of a waxy bloom on the cuticle, e.g. the endemic *Zophosis mnizechi*, *Z. fairmairei*, and *Onymacris rugatipennis*, either to reduce water loss or to reflect incident radiation.

The abundant tenebrionid beetles track their food availability and hence the very variable rainfall of the Namib Sand Sea. Females, on average, lay an egg every second day. The vast majority of these eggs soon desiccate in the dry sand where they are laid. But, if they are laid at the base of a *Stipagrostis sabulicola* grass clump or *Trianthema hereroensis* plant where fog water accumulates, or if they are laid during an exceptional rainy season, the eggs will hatch and development will continue. Depending on the time of year the eggs are laid – influenced by temperature experienced as well as food and water availability – they may hatch as quickly as 8 weeks or require 10 months to reach maturity.

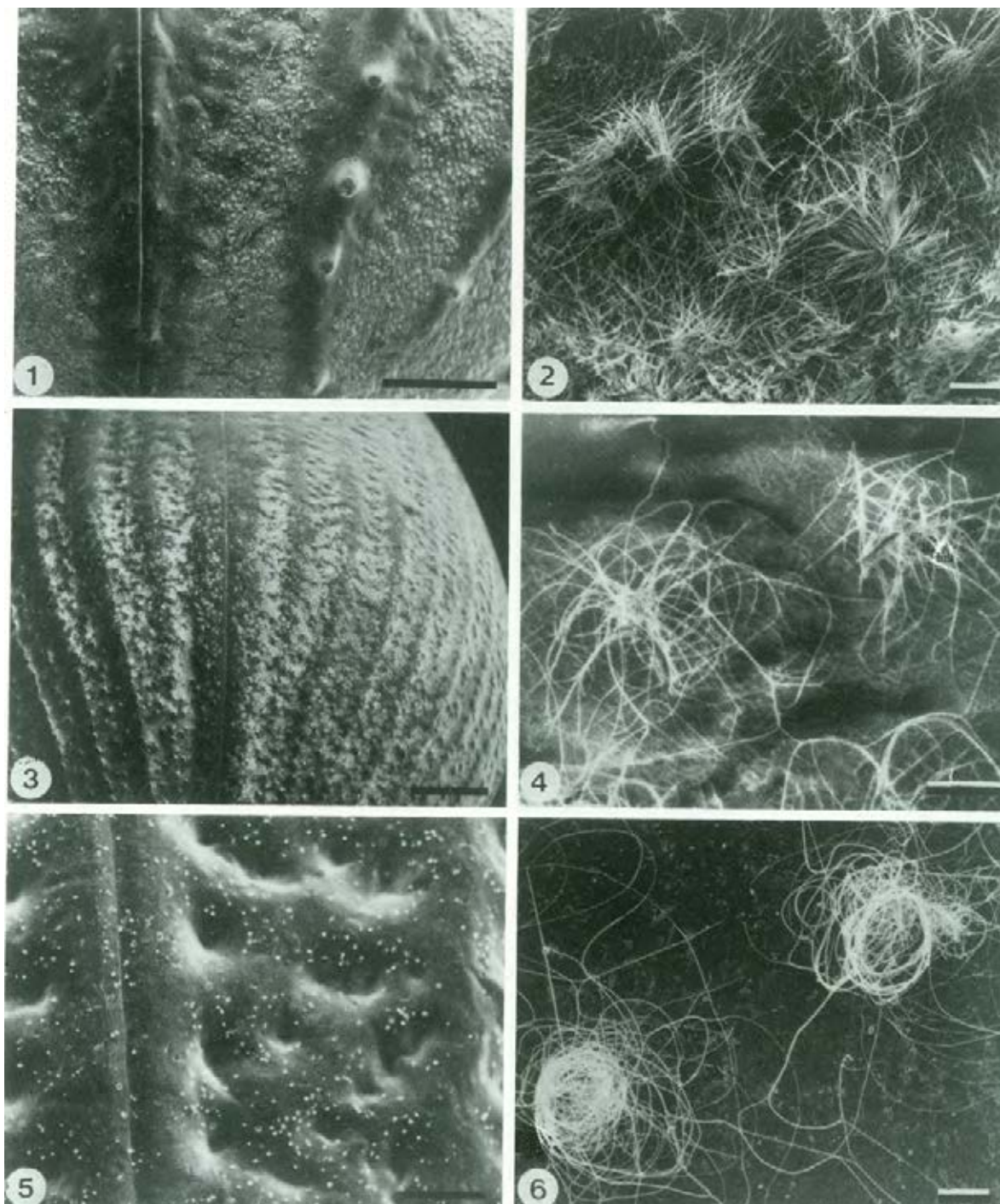


Figure 2.a.47: Physiological adaptation to conserve moisture and reduce desiccation includes the evolution of protective layers such as wax blooms. Wax filaments exuded by special glands cover the surface and reflect heat. The more arid, the more wax is extruded (electron micrograph after McClain, Gobabeb Centre)




Figure 2.a.48: The spectacular fog-basking behaviour for drinking water by the sand sea endemic *Onymacris unguicularis* is a well-known evolutionary superlative (Gobabeb Centre)

Onymacris unguicularis, the shiny black head-standing, fog-basking beetle is a unique inhabitant of the coastal reaches of the Namib Sand Sea. Usually active in the afternoon when the wind is blowing fresh detritus onto the dune slipface, it also emerges on foggy mornings while it is still dark to slowly make its way to the dune crest. There it faces into the fog-bearing wind, its body serving as a fog condensation unit. This species, and its close northern relative, the black-and-white *Onymacris bicolor*, have evolved a fog-capturing technique unknown in other deserts of the world.

The genus *Lepidochora*, with at least four species endemic to the Namib Sand Sea, can be called a ‘fog-collecting construction-engineer’ of unusual habits. All these species have a disc-shaped body that allows them to rapidly dive into and swim under the loose sand. It too normally feeds in the afternoon or evening as wind swirls across the dunes and slipfaces bringing fresh detritus. However, early on foggy mornings before it gets light, when the fog arrives in the desert and the surface grains are wet, these beetles emerge from beneath the sand and start constructing a trench through the wet surface grains. The raised edges of the trench stand out above the smooth sand surface and capture moisture blowing past.



Figure 2.a.49: The distinctive disc-shaped structure of *Lepidochora porti* allows this beetle to dive and swim into sand. The extraordinary behaviour of constructing trenches to collect water from fog is one of the many unique adaptations of Namib Sand Sea endemics found nowhere else in the world (Gobabeb Centre)



After constructing such a fog collector, the beetles then return along the walls of the trench and drink the captured water from between the sand grains. These beetles, active in the evening and at night, and more sensitive to light than some of the other species, have yet to be filmed undertaking their engineering feats.

Termites: Termites are the under-recognised consumers of plant material in African savannas, and have been described as ‘keystone species’ and ‘ecosystem engineers’ that actively contribute to ecosystem functioning. They play a similar role in the Namib Sand Sea. It is surprising to learn that termites of several families and living in different habitats are found in the sand sea. Termites are generally soft-bodied insects that lack adaptations to desiccation that usually exclude them from extreme aridity such as found in the Namib. These species are predominantly the widely distributed harvester termite *Hodotermes mossambicus*, which is common in the interdunes of the sand sea and whose tracks are commonly found in the ancient Tsondeb Sandstone underlying the active dune sea, and a subterranean sand dune specialist species *Psammotermes allocerus*.



Figure 2.a.50: Harvester termite workers *Hodotermes mossambicus* gathering detritus (Gobabeb Centre)

Termites are particularly important in nutrient turn-over and decomposition processes in the Namib Sand Sea. First estimations suggest that *Psammotermes allocerus* could probably be the most significant consumer of detritus in the Namib dunes. Its burrows are visible as eroded tubular galleries projecting just above the sand surface, at any place on a dune. They live underground within the sand sea, not as swimmers but as tunnel constructors. Contorted, prickly hedgehog - looking cemented sand structures found at the base of some dunes are the products of these termites forming their ‘carton’ around clumps of detritus or dead plants. Their brood chambers, constructed of sand grains glued together forming a smooth-surfaced oval compartment about 100 mm in diameter, can also be found eroded out at the edges of dunes. Generally their nests are metres below the sand surface and the only evidence of their presence is their foraging tunnels projecting above the sand. The great depth of moisture in the sand dunes is what causes the termites to locate their nests so far below the sand surface and to frequently forage in the slightly moist sand surrounding plant roots.

Termites are underground detritivores while adult tenebrionid beetles and fishmoths are their aboveground counterparts. While foraging on the surface, the beetles and fishmoths select the richer elements of the detritus such as the seeds and broken bits of insect matter. In contrast, the termites forage on the cellulose of the plant leaves and roots leaving the more nutritious morsels behind. This selective feeding behaviour tends to sequentially concentrate components of the detritus that are covered and then uncovered by the wind-blown sand.

Fishmoths: A group that falls firmly in the detritivore pigeonhole is fish moths or silver fish, particularly the lepismatid family, of which there are at least fifteen species in the Namib Sand Sea, thirteen endemic to the central Namib dunes (Table 2.a.5). Their differing shapes and sizes reflect the specific microhabitats they occupy: spines on the legs become longer, stronger, more numerous and more like a comb structure in parallel with their preference for loose sand, and their bodies become more 'fish-shaped' in the sand-swimming forms.

Table 2.a.5: Fishmoth (Order Thysanura) species richness in the Namib Sand Sea (from Annex 13)

Nominated area	Exotics (aliens)	Desert endemics (excluding dunes)	Sand sea species	Sand sea endemics	% Sand sea endemism
19	1	1	15	13	87%

Ctenolepisma terebrans, with its long slender shape, lives on stable, vegetated parts of the dunes and in interdune gravel plains and is most common in the Namib Sand Sea. *C. pauliani*, similarly shaped but with leg spines arranged in a comb, is common in vegetation hummocks but is also found on compacted bare sand. Two species that are active on the surface of the slipface and dune crest are *Mormisma wygodzinskyi* and *Sabulepisma multiformis*. They have short, rounded bodies and the hind legs are long for running rapidly over the unconsolidated sand. They dive under the sand surface when requiring shelter. Two species that are active mostly under the surface are *Namibmormisma muricaudata* and *Hyperlepisma australis*. They both have a hydro-dynamic shape, broad at the head, a tapered, humpbacked body and short appendages, apparently for sand swimming. Finally, *Swalepisma mirabilis* also lives on the slipface but it is active during cold, calm early morning fogs. Although common and apparently more numerous than in other dune deserts, much remains to be found out about these unique, important detritivores and the role they play in nutrient cycling in the Namib Sand Sea.

The autecology of the whole constellation of other endemic species, such as, *inter alia*, the *Comicus* crickets, the *Julodis* jewel beetles, *Leptostethus* weevils, *Scarabaeus* flightless dung beetles, *Apterogyna* wingless wasps, scale insects, *Pamares* antlions, and many others is largely unknown.



Figure 2.a.51: A fishmoth *Ctenolepisma terebrans* digging a shelter. Other closely related species are highly adapted to swim into loose sand of slipfaces (Gobabeb Centre)





Predatory invertebrates: Small predators of the Namib Sand Sea take advantage of the special conditions in which they live – such as short windows of time during which it is possible to forage every day, the bare fluid-like substrate they can swim through or the loose surface across which they must move (Table 2.a.6). They display a variety of behavioural, morphological and physiological adaptations that enable them to cope in this habitat with its completely unique characteristics.

Spiders: All of the conditions that typify desert sand dunes – sparse vegetation, loose substrate, strong winds and a dry and thermally fluctuating surface climate – do not favour aerial web-building spiders. In this habitat, nocturnal wandering spiders predominate, and they have specialised behavioural and morphological traits that enable them to burrow in and hunt on sand. Twenty species of endemic sand-dwelling spiders are known from the Namib dunes (Table 2.a.6). A further twelve species also live in the dunefield but are not truly sand-loving; instead, they live on and under plants and stones. Of the dune-living species, the most well-known is the ‘dancing white lady spider’, *Leucorchestris arenicola*, an endemic sparassid or huntsman spider.

Table 2.a.6: Arachnid species richness in the Namib Sand Sea (from Annex 12)


Nominated area	Exotics (aliens)	Desert endemics (excluding dunes)	Sand sea species	Sand sea endemics	% Sand sea endemicity
138	4	15	44	37	84%

A striking feature of spiders found in the Namib Sand Sea is their large size and robust appearance. *Leucorchestris arenicola* measures up to 14 cm across with its legs outstretched, and weighs up to 5 g. This is the largest of the dune spiders, but three-quarters of adult Namib dune spiders are larger than 5 mm, a higher proportion than in most other habitats. Of particular note is the armament of strong spines on the legs and pedipalps, as well as the brushes of modified hairs on the legs. These appear to be an adaptation to walking on loose sand and burrowing into it, and they may function in communication by picking up vibrations in the ground. Strong setae, spines and claws on the legs and pedipalps also help in digging.



Figure 2.a.52: The white lady spider *Leucorchestris arenicola* is renowned for its ‘dancing’ behaviour when threatened by a predator (Gobabeb Centre)

Most of the sand-dwellers live in burrows with some kind of a silken door or screen over the entrance. This allows them to penetrate below the top 6 cm of sand that gets dangerously hot in midsummer, and in fact more than half of all Namib spiders dig deeper than 20 cm, where daily temperature fluctuations are minimal. For this, their silk-producing spinnerets have long spigots (‘fingers’) that are pushed into the sand to interweave the grains, forming little nodules that,



repeated in rings along the length of the burrow, stabilise the sand and keep the burrow open. This works even in the very loose, unconsolidated sand on a slipface, which is the preferred burrowing site of the wheel spider *Carparachne*.

Leucorchestris arenicola, the dancing white lady spider, is confined to the Namib Sand Sea, but is absent within about 20 km of the coast probably due to the windy and foggy conditions there. It constructs a silk-lined burrow in the sand, the top of which is covered over with a mat of silk and sand that serves as a trapdoor. The obliquely descending burrow provides refuge from the temperature extremes on the surface, but is primarily designed as an ambush site. The spider positions itself upside-down in the tunnel, 'listening' with its feet for vibrations on the sand surface that will trigger it to rush out and grab its prey. It seizes its victim and bites immediately, the strong fangs penetrating even the tough external covering of beetles. As soon as the prey stops moving, it is dragged into the burrow and consumed.

Leucorchestris is a big animal and makes a conspicuous imprint on the sandy surface of its habitat. The most conspicuous of these is made when it 'drums' by rapidly tapping all 8 feet in quick succession, leaving a print of each of the tarsi and of its own body in the centre, with the head and body portions easily identifiable. These tracks have been very useful in recreating and mapping out the movements of individual spiders.




Figure 2.a.53: An unwary *Palmatogecko rangei* being devoured by *Leucorchestris arenicola* – the high endemicity within the Namib Sand Sea results in unusual species interactions and food webs (Gobabeb Centre)

From seeing such tracks on the dunes, early spider researchers in the Namib discovered that the white lady spider devours the delicate and defenceless web-footed gecko, *Palmatogecko rangei*. While this has been confirmed by more detailed work, in fact beetles form the bulk of its diet, followed by moths and spiders of its own kind. On average, prey items are about one-third of their own mass, but they do occasionally take prey that is larger than they are.

Cannibalism is not uncommon in spiders and scorpions. In *Leucorchestris*, young spiders eat

their siblings or, if conditions are bad, the mother eats her own offspring. In *Seothyra*, the offspring eventually eat their mother as they grow in the maternal nest.

The spiders generally stay indoors, so to speak, on cold nights (ambient temperature less than 15°C), in foggy conditions that make the trapdoor clammy, on nights with a bright moon or with a strong wind. They become quiescent in cold weather, even torpid, and eat less in the winter. In windy conditions it is probably difficult for them to detect prey on the surface against the background noise



of moving sand grains, and they probably also get battered or risk the trapdoor being damaged if they venture onto the surface. Being white they are conspicuous on the sand surface and activity is less on brightly lit nights probably to avoid predation. Surface activity is noticeably less in the nights of each week on either side of a full moon. The morning inspection of tracks after these nights shows that the spider usually walks less than 20 cm from the burrow and then returns – a kind of ‘check-up’ of conditions before returning to safety.

White lady spiders generally occupy the lower, more stable dune slopes in preference to higher up on the dunes. They are territorial, defending an area with a radius of about 3 m from the burrow. With burrows sometimes less than 2 m from each other, it is obvious that a spider venturing out onto the surface is taking a great risk by entering the territories of its neighbours. Not surprising, then, that they confine themselves to the area within about one metre of their burrow most of the time.


Males, however, undertake long journeys far from their burrows in search of mating opportunities. Males may walk more than 300 m in an outward, wandering path that takes them up to 50 m from their burrow in a straight line distance. The males move cautiously and deliberately advertise their presence by drumming every so often on the desert floor. It may be a means of communicating to other males in their burrows or it could be an advertisement call to females, notifying his availability for mating. Such precise orientation over long distances is exceptional and is facilitated by the unique characteristics of the Namib Sand Sea.

At about 70 days old the white lady spiderlings move out of the maternal nest and build their own burrows close by. They must survive great risks posed by other spiders of their own kind and predators such as gerbils and owls. From a clutch of about 80 eggs, about 8 spiderlings will emerge and disperse, and of these, one will probably make it to adulthood at about 24 months of age. Thereafter, males survive for another one or two months, and females usually for more than another 6 months. Compared to other spiders, this is considered slow development and a long lifespan.

Carparachne aureoflava: Another huntsman spider, the golden wheel spider, is so named from its ability to roll its legs into a ball, take on the shape of a disk, and cartwheel freely down a slope. This it does when it is exposed by the digging actions of its main predator, a pompilid wasp. Although there are other animals that can roll into a ball, such as hedgehogs and pangolins, this is the first confirmed use of the wheel by an animal. A burrow situated near the top of a slope offers a better chance of escaping from a wasp this way, as the spider can roll further and can quickly get out of the



Figure 2.a.54: *Carparachne aureoflava* exploits gravity to cartwheel down a dune slope by contracting its legs and launching itself sideways (Gobabeb Centre)



visual and olfactory range of the wasp. A spider that opts to wheel away can almost always escape from a wasp, but one that resorts to running – which it cannot do for longer than a few seconds – is doomed to become the wasp’s prey.

Seothyra: Wandering and hunting on the surface might appear to be the only way for a spider to live in a habitat of loose shifting sand. But there is a kind of web-building spider that is locally abundant in the Namib dunes. Its web is embedded firmly in the sand. This is the only web spider of the central Namib that is obligatorily psammophilous (forced to live only in sand), and it can reach densities of up to 50 webs per square metre in favourable places in the dunes.



Figure 2.a.55: A well hidden *Seothyra* buck-spool spider lurking beneath its web (Gobabeb Centre)


Seothyra henscheli makes a sticky capture web in loose, shifting sand. On the surface, the trap is visible only as four shallow depressions, which give the owner its common name of buck-spool spider. This masks an elaborate silk-lined roof, chamber and tunnel in which the spider hides. The lobes are lined with sticky silk and form a capture web. As initially described: ‘When a hot-footing ant stumbles into the trap, the spider erupts into action. It rushes up to the edge of the mat, grabs the ant by a leg, and pulls it

down onto the mat. There the ant becomes enmeshed in very fine, sticky silk that hooks its fur like velcro. A few seconds later, the spider vanishes down the cool burrow, leaving the ant to fry on top. Twenty seconds or so later the ant succumbs and the spider reappears to retrieve it.’ Yet another unique adaptation taking advantage of unique characteristics of the Namib Sand Sea.

In this windy habitat, the web needs to be maintained to stay functional. In the morning the spider flicks the edge of the capture lobes to dislodge sand that has collected there, and occasionally adds new sticky silk to the lobes. When the spider outgrows its tunnel, it builds a new one contiguous with the old but still keeps the original chamber and surface mat. This avoids the necessity of going onto the sand surface, and reduces the amount of rebuilding it must do. Storm winds do sometimes inundate the webs altogether or scour them out, from which the spiders may not recover.

Male *Seothyra* are brightly coloured and, during the mating season, walk around on the sand surface during the day. In the vicinity of Gobabeb they resemble the dune ant *Camponotus detritus*, while elsewhere they resemble the ant *Camponotus fulvipolus* or the mutillid wasp *Dasylabris*. All of these are aggressive species that are either not preferred prey items or actively avoided by other predators, and it is likely that males probably derive protection by mimicking these noxious insects.

Seothyra is a ‘sit-and-wait’ predator which enables it to continue foraging when conditions on the sand surface are extreme. While its ambush site is ready and sand surface temperatures reach up to



75°C, the spider is ‘sitting and waiting’ in its thermal refuge where, at the bottom of the burrow, the temperature rarely exceeds 35°C. Even though it avoids the hot surface, *Seothyra* has possibly the highest thermal tolerance of any spider species. It needs it because, with a body mass less than 300 mg, it heats up very quickly when it goes out onto the surface to handle prey that has become entrapped. When doing so, it occasionally has to shuttle back into its burrow to cool off. The high thermal tolerance enables the spider to forage efficiently at high ambient temperatures. Conversely, when ambient temperatures are low, the burrow is relatively warmer, enabling *Seothyra* to keep active and vigilant during cool conditions too.


Webs are constructed on gentle dune slopes, and characteristically occur in ‘colonies’ or high-density patches. When spiderlings disperse from their maternal nest they simply remain near their mother’s site. This may explain why, even though densely populated sites are characterised by abundant ants, there are also spiders living in poor sites when good sites are vacant nearby. When food is abundant, spiders put on weight and reduce their activity. In contrast, when food is limited, hungry spiders increase their foraging effort by increasing the trapping area of the web, but they rarely relocate.

***Camponotus detritus*:** Take a walk anywhere in the dunes of the central Namib and you will be met by an aggressive ant, antennae and body in full alert, lunging forward at you with jaws wide open. Its abdomen is tucked under its body and projected forward to squirt formic acid while setting off all its neighbours to join the offensive. This is the endemic *Camponotus detritus*, the only ant species in the western dunes of the Namib Sand Sea and the dominant one in the east, where it shares the habitat with other species. Despite, or maybe because of, being so conspicuous on the bare sand, predators are deterred from eating these ants owing to the unpalatability of the formic acid they contain and readily spray on their enemies. Minor workers, usually encountered on the dune surface, are fairly large (8-14 mm).



Figure 2.a.56: A worker of the endemic ant *Camponotus detritus* foraging (Gobabeb Centre)

Each colony has a few nests but only one queen. When the mother nest becomes too small, workers excavate a daughter nest nearby and carry the brood across the sand to the new nest. The nests are simple affairs, just tunnels and chambers constructed among the roots of perennial plants on the dunes, most usually under *Trianthema* or *Stipagrostis* tussocks. Sand under the plants is usually firm and the roots provide a framework for the interconnecting passages. A colony consists of up to five separate nests that may be close together or up to 100 m apart. But they all make up the territory of a colony and any individual venturing into the territory of a neighbour is likely to be attacked and dismembered very quickly.



Ant nests excavated at any time of the year contain eggs and winged reproductives, as they breed all year round. They can do this because of their ever-present source of food, honeydew, which is excreted from endemic plant-sucking scale insects and endemic aphids on dune plants. This is a largely untapped food resource in the dunes, and a liquid one, so the ants are never short of moisture. While these ants concentrate most of their foraging activity on gathering honeydew, they also take other foods opportunistically. Workers are sometimes seen eating pollen and nectar from *Trianthema* flowers, and they readily take dead and defenceless animals found on their meanderings.

The critical factor limiting the number and distribution of *Camponotus* colonies remains the availability of honeydew. *Camponotus* are least abundant in the dunes near the coast, most abundant in the central dunes, and of intermediate abundance inland. This density pattern closely parallels the distribution of scale insects.

Camponotus detritus is an extremely successful ant species in the dunes of the Namib Sand Sea. Although sand surface temperature gets very high, the ant's legs can lift it about 5 mm above the surface so it experiences a temperature about 10°C lower than the surface. On top of this, it takes in mostly liquids, and frequently shares this food through trophallaxis, a kind of mouth-to-mouth contact during which food is passed from one individual to another. Groups of *Camponotus* have lower rates of desiccation than solitary individuals. So in short, this species is well adapted to the Namib Sand Sea with plentiful year-round food supply, temperatures it can handle and, over most of its range, few other ants to compete with.



Figure 2.a.57: Voracious predation in the Namib Sand Sea: an asilid robber fly feeding on an endemic *Leptostethus weevil* (Gobabeb Centre)



Reptiles

For the eight different types of endemic, dune-dwelling reptiles, the ability to quickly submerge and swim through the loose, aerated sand is critical. They need to swiftly escape from predators or from heat in a wind-swept, sun-baked habitat where cover is sparse and sand surface temperatures climb uncomfortably high. The two options are sand-swimming and sand-burrowing. Sand-swimmers either dive head-first into the sand or use low-amplitude, high-frequency, lateral undulations to disappear into it. Moreover, they usually show modifications for under-sand breathing.

In comparison, sand-burrowers usually have short bodies poorly constructed for lateral undulations but their feet are modified for digging. These are usually active at night. Others such as the legless lizards live their entire lives beneath the surface moving through the fluid sand. Species richness of reptiles in the sand sea is summarised in Table 2.a.7.



Figure 2.a.58: The endemic sidewinding adder *Bitis peringueyi* hiding in the sand (Gobabeb Centre)

Table 2.a.7: Reptile species richness in the Namib Sand Sea (from Annex 14)

Nominated area	Exotics (aliens)	Desert endemics (excluding dunes)	Sand sea species	Sand sea endemics	% Sand sea endemism
71	0	6	17	7	41%

Among desert geckos worldwide, the most highly specialised and structurally modified species are those that live largely (hyperpsammophilous) or entirely (ultrapsammophilous) on sand dunes. This habitat is not uniform and their adaptations must cope with slipfaces, windward and leeward slopes, all surfaces that differ in terms of sand compaction, as well as the sandy interdune valleys.

Modifications for walking on sand include fringes on toes, spinous, swollen soles, and webbed feet.



Figure 2.a.59: Barking gecko *Ptenopus kochi* (Gobabeb Centre)

Extensions of the scales to form comb-like fringes along the sides of the toes act like snow-shoes, increasing the surface area of the foot and preventing the animal from sinking into the sand. There is a direct relationship between fringe size and soil softness in the barking geckos, *Ptenopus*. The longest fringes are found in *Ptenopus kochi*, which inhabits riverbeds and interdune areas with very fine sand and silt. The common barking gecko, *P. garrulus*, has shorter toe-fringes.

Toe-fringes are taken to the extreme in the Namib obligate dune dweller, *Meroles anchietae*, in which the fringes in adjacent toes are in contact and even overlap. For *Meroles* (formerly *Aporosaura*), exclusion of fine sand particles is probably improved with the exaggerated fringes, making it more efficient in underground movements.

Webs between the toes perform the same function as toe fringes, by increasing the surface area that presses against the sand while propelling the animal forward. This was originally used to explain the webbed feet of *Palmatogecko rangei*. Although the *Palmatogecko*'s webbed feet no doubt assist its movement on a sandy surface, it is more likely that the webbing and associated bone, cartilage and muscle structure evolved for the feet to function as sand shovels. The sand at the dune base and on windward slopes is compacted and has considerable bearing capacity, enough to support the weight of a person, even a car. *Palmatogecko* is able to dig tunnels into the hard sand in this habitat thanks to the well-supported webs between its toes.

***Meroles anchietae*:** In terms of biomass, the conspicuous, sand-coloured *Meroles* is a small though dominant vertebrate in the central Namib dunes, and holds a key position in the food web. These lizards are omnivorous, eating seeds found among detritus as well as insects and any other small arthropods they can catch. They forage mostly on the upper vegetationless parts of the dunes, but will also venture towards grass and *Trianthea* hummocks at the foot, and even into the interdunes for a short distance on low dunes. They take whatever is available, and have been recorded eating mostly kelp flies in the dunes close to the coast, small beetles, ants, solifuges, fishmoths and even scorpions around Gobabeb, and weevils in the dunes of the northern Namib. Beetle larvae are also commonly eaten and are presumably shovelled out from just beneath the surface where they are active on cool, humid mornings.




Figure 2.a.60: Note the feet of endemic *Palmatogecko rangei* (Gobabeb Centre)



Figure 2.a.61: A vigilant *Meroles anchietae* lizard watching for unwary prey (Gobabeb Centre)

The lizards are capable of great speed on soft sand, and display considerable agility chasing and leaping up to catch flying insects. They have excellent vision, and will sprint away from the first sign of danger. When further pursued, they are quick to dive into the sand with what looks like a mere flick of the tail. For this their shovel-shaped snout is appropriate, and the nostrils face backwards and have a cartilagenous flap to prevent the entry of sand.



These lizards have been well studied and provide an ideal species for monitoring population variations. The number of individuals on a single dune may vary several-fold depending on the recent rainfall and vegetation cover in the Namib Sand Sea.

The reproductive cycle of *Meroles anchietae* is also well adapted to the unique constellation of habitat characteristics of the Namib Sand Sea. Surprisingly, the cycle is typical of tropical lizards as reproductive activity can be continuous for more than one year. Similar continuous reproductive strategies have also been reported for other sand sea endemics, contrasting sharply with the boom or bust reproductive strategy usual for arid environments world wide. A possible explanation of the continuous reproductive pattern relates to its omnivorous diet that includes arthropods as well as seeds that are picked out of detritus on the slipface. When insect abundance is low, they can still fulfil their energy needs from seeds, allowing them to continue year-round egg production. Their response to an abundant supply of insect prey is to accumulate large quantities of fat. The fat bodies are used by females to maintain egg production through the dry period, although at a lower rate. Territorial males use their fat reserves to defend their territories and to secure copulations with females. Moreover, in addition to the usual abdominal fat bodies found in these lizards, *Meroles anchietae* also stores fat in large deposits under the skin in the pectoral region – a phenomenon not known in any other lizard.



Figure 2.a.62: A well camouflaged endemic sand lizard *Meroles cuneirostris* (Gobabeb Centre)

This is in contrast to *Meroles cuneirostris* which also inhabits the dunes of the Namib Sand Sea but more the dune slope and interdune valleys rather than the slipfaces. They are fully insectivorous. Due to the seasonal fluctuations in their food, *Meroles cuneirostris* has a distinct seasonal breeding cycle.

Another remarkable feature of *Meroles anchietae* is the exceptionally large size of their hatchlings. At hatching, the babies are about 60% of the length of an adult female, and about 20% of her weight. This is advantageous in the extreme desert environment, since the surface-to-volume ratio is reduced in a larger body, and therefore the young are less susceptible to dehydration. Their large size probably also makes them capable of taking a wide diversity of prey, and it reduces the time to reach maturity, all of which presumably are factors in their favour for successful adaptation to the Namib Sand Sea.

Sidewinding Adder: The endemic dune-dwelling adder, *Bitis peringueyi*, is active during any time of the day or night in the Namib Sand Sea. They are most commonly encountered in the daytime, however, since they tend to follow the activity patterns of their main prey species, *Meroles* lizards. They remain stationary, concealed under the sand surface in their ambush position, usually on a dune slipface or at the base of a clump of vegetation. They submerge their body beneath the fluid sand by shuffling their coils to and fro, shifting sand to the side and so lowering themselves beneath the surface. Only the eyes, situated on the top of the head, are exposed, and the body colouration matches the sand grains closely. As the snake warms up it simply digs its entire body to cooler depths. The characteristic side-winding movements recorded by unique tracks on the sand surface take place mainly at night as they move between ambush sites on the dune slipface or under vegetation.

These snakes drink condensed fog-water from their body surface. The sidewinder flattens its body, increasing the surface area exposed, moves its head back and forth over the body to take up the water droplets, and every now and then raises its head, apparently to assist the flow of water into the digestive tract. Individuals can gain as much as 14% of their body weight from this practice. Like *Meroles anchietae*, the distribution of the species is limited to the Namib fog belt, suggesting that they cannot survive without this water source.

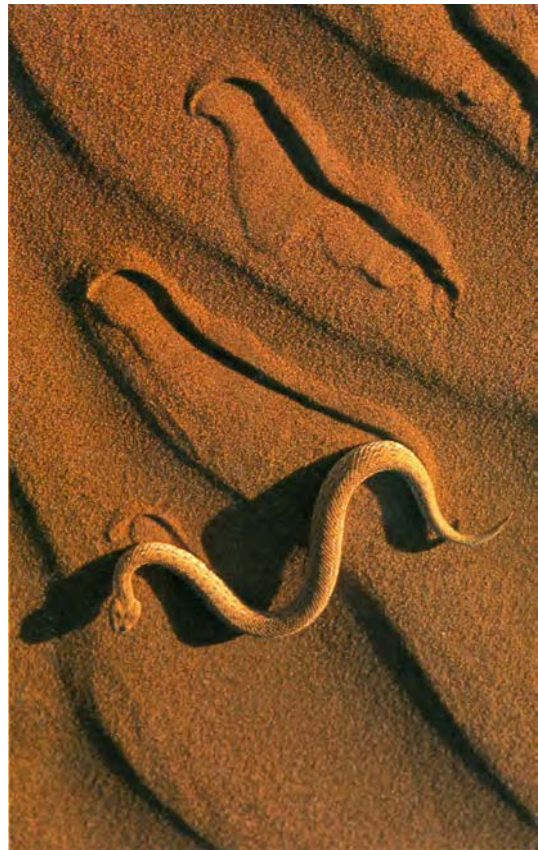


Figure 2.a.63: The unmistakable tracks of *Bitis peringueyi* (Gobabeb Centre)



Figure 2.a.64: *Meroles anchietae* surveying his domain (Gobabeb Centre)



Birds

Well over 100 species of birds have been recorded over the dunes of the Namib Sand Sea – but few of them live permanently in this hyper-arid habitat. Most are dependent on habitats adjacent to the dunes while using the dunes as foraging areas, for example owls or pale chanting goshawks, or are simply passing by. Ostriches may live permanently in the Namib Sand Sea but are not endemic. Only one lark is endemic to the Namib Sand Sea (Table 2.a.8). A brief overview document on birds is included in Annex 7 as well as complete bird lists in Annexes 16 and 17.


Table 2.a.8: Bird species richness in the Namib Sand Sea (from Annex 16 and 17)

Nominated area	Sandwich Harbour	Exotics (aliens)	Desert endemics (excluding dunes)	Sand sea species	Sand sea endemics
418	117	3	4	9	1

Larks: The endemic dune lark is the only bird permanently resident in the Namib Sand Sea. It lives entirely on the dunes, venturing only a short distance into the interdune valley adjacent to the lower slope of a dune. Like many other larks in desert areas, the dune lark, *Certhilauda erythrochlamys*, drinks no water and relies solely on its food to supply its metabolic water. It feeds on seeds of plants found on the dunes (*Stipagrostis* grasses and the dune shrub *Trianthema hereroensis*) as well as insects that live in and close to these plants – ants, locusts, beetles, caterpillars and termites. The larks have a characteristic method of finding seeds and insects that takes advantage of the array of micro-habitats on a single sand dune. On the lower dunes, they drill a small cone into the sand with a short probe and waggle of the bill, ‘bill cratering’, which unearths seeds hidden under the surface. Higher up on the dune slope, they forage near the only two plants that remain green throughout the year which, while providing seeds, also attract a range of insects. Thus the birds tend to concentrate on insects in the upper zones of the dune. They have a clear pattern of movement from morning till midday, starting where they roost in the upper parts of the dune, gradually moving down the slope to the dune base and then returning to the upper portion as midday approaches, where they stay until the pattern is repeated later in the afternoon. While they are resting in the shade of grass and *Trianthema* clumps at midday, they glean insects from the leaves and make short dashes away from the plant to pick up others on the sand. Several dune larks have been recorded as living for more than five years, an unusual length of time for these small birds but a time period that allows them to skip breeding for a year or two if conditions are particularly poor. One female was ringed twelve years before its most recent recapture.



Figure 2.a.65: The endemic *Certhilauda erythrochlamys* (@Trevor and Margaret Hardaker <http://www.hardaker.co.za>)



Larks are highly successful in arid habitats. Nine species altogether are found occasionally in the dunes. Of these, all but the dune lark are nomadic to some extent. Some gather in flocks where there is abundant food (seeds or small insects or both) in grassy areas after rain. The most impressive bird irruptions are of greybacked sparrowlarks, which can suddenly appear in their thousands in the interdunes, and disappear again after a few weeks.

Lappet-faced vultures: Lappet-faced vultures, *Torgos tracheliotus*, are a spectacular part of the fauna of the Namib Sand Sea breeding in trees in the ephemeral rivers that penetrate the dunes. These large vultures, with a wingspan of 2.8 m, nest on the tops of trees. With large nests from one to three metres in diameter they raise a single chick each year. Like other vultures, they are conspicuous if poorly understood.



Figure 2.a.66: Ludwig's bustard
Neotis ludwigii (Demasius)

Ludwig's bustards: Ludwig's bustards, *Neotis ludwigii*, are amongst the largest bustards in existence. These spectacular birds move widely across the landscape but, after a good rain and emergence of numerous tenebrionid beetles and other insects on the dunes, are frequently found in the Namib Sand Sea.

Sandwich Harbour: Sandwich Harbour, although no longer a functioning harbour, is a spectacular coastal lagoon designated as a Ramsar site. The Sandwich Harbour lagoon on the northwestern coast of the Namib Sand Sea was a palaeomouth of the Kuseb River. Fresh water still seeps out from the palaeochannels resulting in dense reed beds and brackish water in the lagoon that supports a wide diversity of aquatic invertebrates. This phenomenon attracts unusually large numbers of Palearctic and African migrating birds.

Most waterbirds that are found at this Ramsar site migrate from their Palearctic breeding grounds in the northern hemisphere at the end of summer. They spend the austral summer feeding and resting. These include thousands of curlew sandpipers *Calidris ferruginea*, sanderlings *Calidris alba* and little stints *Calidris minuta*. Red-necked phalarope *Phalaropus lobatus* and terek sandpipers *Xenus cinereus* as well as Eurasian oystercatchers *Haematopus ostralegus* are also found there. Ringed *Charadrius hiaticula* and grey plovers *Pluvialis squatarola* appear in their hundreds.

During the annual summer census in January 2008, 45,000 lesser *Phoenicopterus minor* and 10,000 greater *Phoenicopterus ruber* flamingos were counted at Sandwich Harbour. The terns are well represented with



Figure 2.a.67: Damara tern *Sterna balaenarum*
nesting on the coastal plains (Gobabeb Center)



at least seven species and some summer counts have recorded 60,000 birds. Common terns *Sterna hirundo* are the most prolific ($\pm 40,000$). In January 1998, at Sandwich, an exceptionally large congregation of 170,000 of these terns was recorded. Others seen are Caspian tern *Sterna caspia*, swift tern *Sterna bergii*, white-winged tern *Chlidonias leucopterus* and the small Damara tern *Sterna balaenarum*. The Sandwich tern *Sterna sandvicensis*, a common visitor to the coast, was first described in 1787 from a specimen found at another Sandwich Harbour in Kent, England.

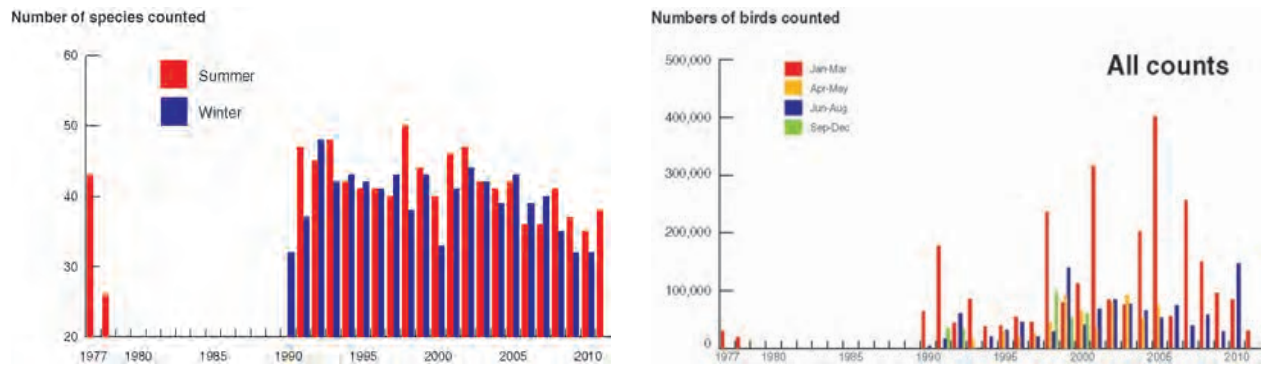
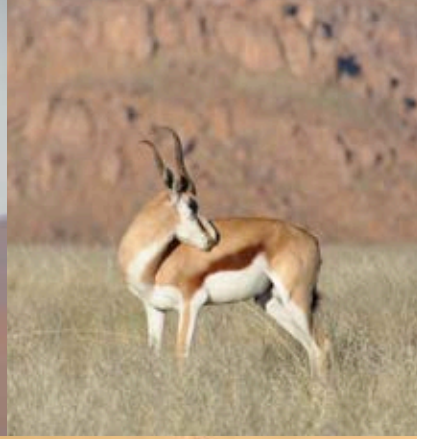


Figure 2.a.68: Migratory and resident bird numbers are regularly monitored at Sandwich Harbour

The Sandwich Harbour Ramsar Site, included in the Namib Sand Sea Property for nomination, is well qualified for the designation. It supports an average of 75,000 waterbirds and on one occasion rising to 400,000. Sandwich Harbour also supports over 1% of the world's population of more than 12 species, including white pelican, avocet and little stint.



Figure 2.a.69: Flamingos circling above Sandwich Harbour (Gobabeb Centre)



Mammals

Only two small mammals are endemic to the Namib Sand Sea: the golden mole *Eremitalpa granti namibensis* and dune gerbil *Gerbillurus paebe* (Table 2.a.9). Other gerbil species frequent this habitat



Figure 2.a.70: The endemic *Gerbillurus paebe* (Gobabeb Centre)

but are not confined to it. A variety of larger mammals enter the Namib Sand Sea for shorter or longer periods. These include the gemsbok, *Oryx gazella*, springbok, *Antidorcas marsupialis*, and Cape hare, *Lepus capensis*, which may remain for months or even a lifetime. Common short-term visitors include predators such as the black-backed jackal, *Canis mesomelas*, brown hyaena, *Hyaena brunnea*, Cape fox, *Vulpes chama* and spotted hyaena, *Crocuta crocuta*. A greater variety

of desert animals may follow an ephemeral river into the dune sea but not travel far into the Namib Sand Sea itself. See Annex 8 for more information on mammals in the Namib Sand Sea and Annex 15 for a detailed list of mammals.


Table 2.a.9: Mammal species richness in the Namib Sand Sea (from Annex 15)

Nominated area	Exotics (aliens)	Desert endemics (excluding dunes)	Sand sea species	Sand sea endemics	% Sand sea endemism
76	9	4	13	2	15%

The Namib golden mole: This small, blind, subterranean insectivore, *Eremitalpa granti namibensis* measures about 8 cm long, and possesses a silky greyish-yellow coat with a silvery sheen. The first living specimens were found in the dunes near the Gobabeb Training and Research Centre in the late 1950s. The species was previously known only from scattered remains in owl pellets. The claws on the front feet are broad and hollowed out to serve as modified shovels for digging through loose sand. Unlike other subterranean animals, the Namib golden mole lacks an underground burrow system, but ‘swims’ through the fluid, oxygenated sand of the Namib Sand Sea and emerges onto the surface to forage for its prey. This



Figure 2.a.71: The iconic endemic golden mole *Eremitalpa granti namibensis* (Gobabeb Centre)



comprises mostly invertebrates such as termites and insect larvae, but includes anything it can catch and overpower, the web-footed gecko *Palmatogecko rangei* being the largest prey item known. Crickets, moths, spiders and legless lizards are also included in the diet.

The animals are solitary and move randomly within their home range of about 7 ha for males and 3 ha for females. These figures are much larger than comparative values for other subterranean insectivores, probably because of the relative scarcity of invertebrate prey to satisfy their energy needs. Food resources are not only sparse but also patchily distributed, so that moles must move considerable distances (up to 1,200 m per night) to find their fill. In doing so they move about the home range in a circumscribed but nomadic fashion, resting by day, and continuing by night within their 'one-day territories'. The home ranges of neighbours overlap somewhat, but encounters between neighbours are rare since each mole forages in a different area of its home range each day. Some form of mutual avoidance, possibly based on scent, might be involved in maintaining the distance between neighbours.

Golden moles search for their prey on the surface, 'dipping' into the sand, probably to help in detecting vibrations underground, but maybe also to check moisture content, or the presence of organic matter or termite casts. They move in a more-or-less straight line very rarely covering ground that has already been searched that night. They switch to sand-swimming when encountering a concentrated food patch such as a cluster of termites, which is usually under a hummock of vegetation. Then their moves are short with frequent turns, ensuring that they keep within the bounds of the patch to cover it intensively.



Figure 2.a.72: Undisturbed traces of golden mole foraging on the early morning dunes (Gobabeb Centre)

While running on the surface exposes the Namib golden mole to owls and other predators, continual swimming would quickly tire them out. The energy cost of sand-swimming is about 80 times higher than that of running on the surface. Fortunately the cost of sand-swimming is much lower than burrowing through solid ground. It is unlikely that the Namib golden mole could exist in areas with such low abundance of food if the substrate was more compacted than that of the fluid sand of the Namib Sand Sea.

Moles in the eastern Namib dunes, where rainfall is higher and vegetation is more concentrated, move shorter distances than those in the west where their abundance may vary from one mole per 4.5 ha to one per 70 ha. These large differences in track length and mole density reflect the differences in prey abundance and hence rainfall, as well as the adaptability of this small mammal.



Namib golden moles are physiologically unusual in their ability to abandon thermoregulation during daily rest, allowing their body temperature to drop to ambient and thus depressing their metabolic rate. Resting metabolic rate is about a fifth of that predicted for a normal insectivorous mammal.

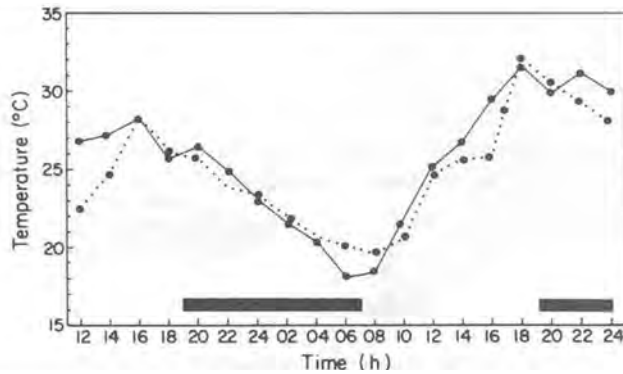


Figure 2.a.73: Daily ambient and golden mole internal temperatures (Gobabeb Centre)

Such a low metabolic rate is advantageous as it allows slow breathing which, combined with the relatively higher humidity underground, results in lower rates of water loss. Perhaps the only 'reptile-like-mammal' known in the world lives in the Namib Sand Sea.

The fauna of the Namib Sand Sea, with its morphological, physiological and behavioural adaptations is one of the outstanding characteristics of this spectacular

environment. Animals that swim through oxygenated sand, animals with high thermal tolerance that know how to effectively evade extremes, animals that build structures to capture fog-water – all contribute to the wonders of the Namib Sand Sea. When combined with very long-lived but small birds and invertebrates, organisms with almost continuous breeding outputs, and creatures that harbour gut micro-organisms that recycle nutrients through this extreme environment, the Namib Sand Sea has no counterpart in the other dunes of the world.

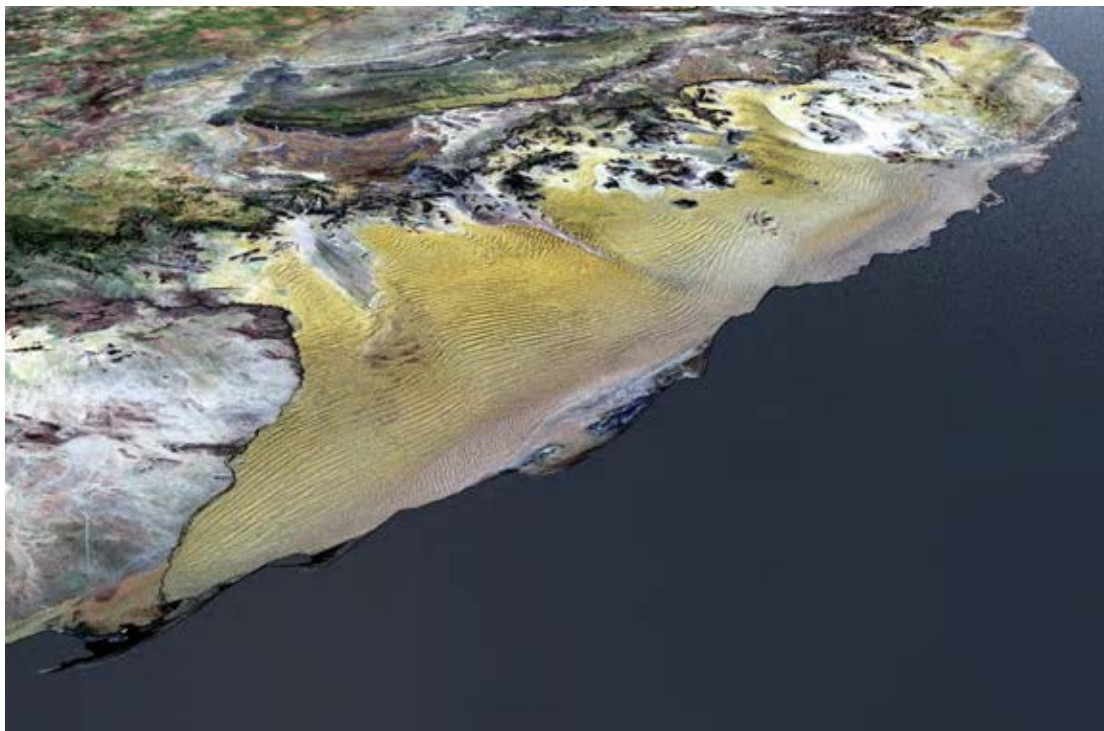


Figure 2.a.74: The vast Namib Sand Sea harbouring a high percentage of endemic species (Bowen/NASA)

2.b HISTORY AND DEVELOPMENT


The human history of the area mainly plays out around and not inside the Namib Sand Sea. It highlights the reality of the Namib Sand Sea acting as a shield between the interior and the coast. The massive dunes and extensive stretches of waterless desert prevented desert crossings while river courses north and south of the sand mass provided natural travel routes. The lack of water and other resources made permanent settlement by large communities impossible. It was only through strenuous effort, e.g. when costs were offset by high-value resources and technological progress that people temporarily settled in the Namib Sand Sea.

Archaeology: Interpretation of archaeological evidence suggests that humans occupied the area intermittently during exceptionally productive periods during the Late Pleistocene and Holocene epochs. Surprisingly, human presence in the Namib Sand Sea dates back several hundred thousand years to the early ancestors of modern people. Artefacts from the Namib Sand Sea show that the 'Out of Africa' migration of early hominins into Eurasia was contemporaneous with other populations settling in decidedly marginal environments such as the Namib Sand Sea. Early Paleolithic (or Early Stone Age) tools are found at a number of locations within the sand sea. The known sites are concentrated along western extensions of some of the ephemeral rivers that now terminate within the Namib Sand Sea. One site is accompanied by *Elephas recki* fossils, dated to between 700,000 and 400,000 years before present (BP) from its geological setting. It is suggested that the elephants were slaughtered at the site. The *Elephas recki* fossils themselves are of interest as they represent a disjunct record of that extinct elephant well known from early hominin and other fossil sites in Eastern Africa. The little research that has been carried out on the sand sea's Early Stone Age occurrences indicates that early hominins may be much more widespread.

Anatomically modern humans apparently arrived much more recently. Middle Stone Age (Middle to Late Paleolithic) artefacts are known, but these are rare and inadequately researched. Most sites from that period (200,000 to 21,000 years BP) are well outside the Namib Sand Sea, which does not allow for informed deductions to explain the few artefacts recovered from within the area. More recent Neolithic (or Later Stone Age) materials are mostly found along the coast in the vicinity of small seeps, springs and at inselbergs. These sites, representing renewed occupation after a long period without people, are presumed to reflect either a break in occupation or the inundation of coastal sites with a rapid sea level rise of more than 100 m after the ice sheets of the Last Glacial Maximum melted between 16,000–10,000 years BP.



Figure 2.b.1: Freshwater seepage at Francis Bay has been used by many people over the last 10,000 years, including those who built the stone circles and other structures on the Sylvia Hill outcrop (Schneider)



The archaeological history resumes around 12,000 years BP, represented by only a few sites along the margins of the Property near Gobabeb, along the Kuiseb River and in the vicinity of Sossus Vlei. Sites from within the last 5,000 years BP are more abundant, but still rare. Three human burials were found under cairns at coastal Sylvania Hill, two of which were dated to around 1,000 and 500 years BP respectively. An extensive stone circle complex at Sylvania Hill, and a number of other stone circle occupation sites both within and immediately adjacent to the Namib Sand Sea indicate that family groups, or 'band' societies, stayed for considerable periods in the desert. Stone circle sites were dated from around 1,000 years BP to recent (20th century) times, but it is not clear which people may have occupied them as no historical or oral evidence has yet been found to explain their construction. It is presumed that those stone circles either served as windbreaks for resident groups, or were constructed as hut foundations or supports. Similarly, middens with pottery and marine molluscs are frequently found within walking distance of fresh water seeps along the coast, dating from around 2,000 years BP to 19th century times. Fresh-water springs or shallow seeps occur at Reutersbrunn, Fischersbrunn, Conception Bay and Sandwich Harbour, all of which supported people from the remote past to the present. Other Later Stone Age materials have been found along the courses of the ephemeral river beds.

The more recent archaeological evidence was interpreted as proof of increasingly intensive hunter-gatherer subsistence strategies with specialised techniques for gathering food (marine shellfish and other resources, Inara melon harvesting), hunting (hunting blinds to ambush zebra, hunting drives, killing of seals and seabirds, spearing sharks and fish), food processing and storage (processing by cooking, drying excess meat and fish), and trading with people in the interior. These specialised techniques would have ensured greater food security in a marginal human environment such as the desert. However, all archaeologists stress that linking these disparate lines of evidence with the ethnographic present is tenuous. No clear historiographical evidence, whether oral, subsistence practice, or historical records, links modern Namibian peoples with those past practices. People were found living along the coast and along the course of the ephemeral Kuiseb River by early explorers from Europe, but they were not the direct ancestors of the modern inhabitants.

Geopolitical history: The Portuguese explorers that pioneered the maritime route between Europe and Asia were likely to be the first non-African visitors to the Namib Sand Sea. In 1486 the navigator Diogo Cão sailed along the Angolan and Namibian coastline to reach Cape Cross to the north where he erected a *padrão* (stone pillar). The next year (1487) Bartolomeu Dias made landfall somewhere along the Namibian coast in the north. From there he continued Cão's first mapping of the coast in such great detail, including the Namib Sand Sea coastline, e.g. Conception Bay coast was originally Golfo da Conceição, that his information was used for three centuries. Diaz successfully rounded the southern tip of Africa into the Indian Ocean before returning to Portugal, erecting a *padrão* at Angra Pequena (today Lüderitz) on his return journey. Diaz's route was only repeated ten years later, in 1497, by Vasco da Gama, who successfully continued on to India.

Numerous Portuguese merchant fleets would follow the Diaz-da Gama route over the next century. The Portuguese retained their monopoly on the seaborne trade between Europe and India by keeping the route secret and fortifying numerous strategic harbours, many of which have been inscribed as World Heritage. Their grip on that lucrative trade was broken by Dutch seafarers in 1596,



Figure 2.b.2: Coins from shipwrecks are found along the Namib Sand Sea coast (Schneider)

after which navigation secrets rapidly spread to other European seafaring nations. It can be assumed that numerous ships would have made landfall on the Namib Sand Sea coast and that many would have been shipwrecked through a combination of navigational error, crews depleted by scurvy, the dense coastal fogs and rapid shoaling along the shore. Porcelain and Dutch coins have been recovered at sites in the Namib Sand Sea that attests to such early contact, while the wreck of a 16th century Portuguese caravel was recently discovered close to the Orange River mouth. However, almost no information accrued over those centuries.

The Dutch unsuccessfully attempted to take over some of the African Portuguese forts as part of their struggle for independence from Spain and breaking the Portuguese dominance in the Indian Ocean. Failing in these attempts, the Dutch East India Company, the first publicly owned corporation in the world, established a strategic resupply station in 1652 at Cape Town. That Cape settlement would have a much greater influence on southern African history than the much earlier Portuguese settlements in Angola and Mozambique. The Dutch ships *Grundel* and *Bode* visited the Namib Sand Sea coast in 1670 and 1677 respectively while exploring the nearby coasts from the Cape settlement. They noted a 'yellow-skinned people' with cattle at Sandwich Harbour but neither ship recorded any other evidence of people along the Namibian coast as far as Angola.

A century later the American Revolution and political changes in Europe resulted in much greater interest in the Namibian coast and adjacent interior. England lost most of her colonies in North America and was engaged in a struggle for dominance with other nations. Thus, before sending their first 'convict' fleet to Botany Bay in Australia in 1787, the British government wished to investigate strategically more promising locations for a penal settlement. The HMS *Nautilus* was dispatched to investigate possible sites along the African coast in Ghana and near the Orange River mouth (the southernmost tip was still Dutch) during 1786. Finding those locations unfavourable, the *Nautilus's* captain sailed northwards from the Orange River along the Namibian coast to investigate various locations such as Lüderitz (Angra Pequena), Spencer Bay, Sandwich Harbour and Walvis Bay. The report was unfavourable regarding a penal settlement, but resulted in the first systematic account of people and resources along the Namib Sand Sea coast. A small group of people were encountered at Lüderitz, with a large settled community at Walvis Bay. The latter were fishing in the lagoon, harvesting !nara, and herding cattle. Other signs of people were found much further north in Angola.

American whalers started visiting the Namibian coast during the 1770s. Their numbers increased rapidly as whale catches elsewhere decreased. They resupplied by trading with indigenous people where possible. Both the Dutch and the Royal Navy viewed that development with some animosity and alarm, while the emergent French dominance in Europe and possible interdiction of the Indian Ocean trade was an additional cause of concern. Attempts by the Dutch in 1793 and English in 1795

to curb outside interest by annexing Walvis Bay did not meet international law. Royal Navy ships subsequently visited the Namib coast frequently, most of which made detailed notes that are available in archives. Strategic information such as where indigenous people were found (which fresh food can be obtained by trade), woody debris on shore (required as fuel for ships' stoves), water sources (to replenish water casks) shipping hazards and navigation information were noted where feasible. It is of interest that during the next century no permanent inhabitants were noted at regularly visited places such as Lüderitz, Spencer Bay, Sylvia Hill, or Sandwich Harbour. The reports suggest a sparse and transient human occupation along most of the coast. The exception was Walvis Bay, from where an established community frequently travelled to Sandwich Harbour and carried out a brisk trade supplying beef and mutton to visiting ships.




Figure 2.b.3: Access to the rough coastline of the Namib Sand Sea could only be gained by small surfboats (Schneider)

Sandwich Harbour with its fresh water seepage (named after the English whaling ship *Sandwich*) was long a focus of human habitation and resource use. Archaeological evidence shows that people exploited the plentiful marine resources there since the fourth century (1,600 years BP). Settlements were established in the Kuiseb River delta at Walvis Bay after pastoralism became established in the Namib Desert during the last millennium. Groups of itinerant visitors from those settlements continued harvesting resources at Sandwich Harbour, occasionally even bringing cattle to graze on the dune vegetation and lush reeds. Sandwich Harbour was furthermore well known as a source for fresh water along the maritime trade route to India. British and Cape Town merchants began commercial exploitation of fish at Sandwich Harbour from 1853 to 1891. The entrance of the harbour then closed and the fishing industry ceased to operate. The indigenous people concomitantly continued gathering !nara melons and marine resources from there, opportunistically also supplying labour for the fishing operations and trading with visiting ships.

The history of Walvis Bay immediately to the north of Sandwich Harbour is probably much more complex because of more water, resources, and ease of access from the interior. The rich cultural history from more than 150 sites in the Kuiseb Delta attests to a long settlement history of the area. Today the indigenous inhabitants at Walvis Bay and along the Kuiseb River (the northern boundary of the Property) are the ≠Aoni Nama tribe or Topnaar people. They were traditionally herders and

The potential economic importance of the offshore islands where seabird guano was harvested as fertilizer for sugar-producing colonies, and Walvis Bay for replenishing food and water, led to the formal annexation of Walvis Bay and Namibia's offshore islands in 1878 by the Cape Colony. The rest of Namibia was claimed by Imperial Germany during the 'Scramble for Africa' in 1884.

Local history: Sandwich Harbour with its fresh water seepage (named after the English whaling ship *Sandwich*) was long a focus of human habitation and resource use. Archaeological evidence shows that people exploited the plentiful marine resources there since the fourth century (1,600 years BP). Settlements were established in the Kuiseb River delta at Walvis Bay after pastoralism became established in the Namib Desert during the last millennium. Groups of itinerant visitors from those settlements continued harvesting resources at Sandwich Harbour, occasionally even bringing cattle to graze on the dune vegetation and lush reeds. Sandwich Harbour was furthermore well known as a source for fresh water along the maritime trade route to India. British and Cape Town merchants began commercial exploitation of fish at



gatherers of Inara melons, the pulp of which they cook and dry to last for more than a year. That tradition of Inara harvesting is estimated to be at least 800 years old, which is almost contemporaneous with the start of livestock herding along the lower Kuiseb. Today, the Nama-speaking Topnaar or Aonin Nama-speaking people still maintain small, mainly 'weekend' farms along the lower Kuiseb River valley just outside the northern border of the nominated Property.

The Topnaars were most likely the people who first made contact and traded with European visitors. At one time, the main supply of meat for the British colony on St. Helena Island was sourced from Walvis Bay with ships purchasing 200–300 cattle at a time. Trade with visiting ships burgeoned during the late 18th and 19th century when American and other whaling ships needed fresh supplies to counter scurvy. Whalers regularly visited Walvis Bay while decimating the whale population along the Namibian coast. The whalers then moved on to other hunting grounds, but a brief guano rush to the islands southwards brought thousands of new ships. At the height of the guano rush hundreds of ships anchored every month at Ichabo and Mercury Islands. For example, during February 1845 it was recorded that 451 ships were anchored in the two-mile wide channel between Ichabo Island and the mainland alone. The situation was similar on Mercury Island off Spencer Bay. During the guano rush, hundreds of sailors were clearing the dried seabird excrement that accumulated over millennia for export to Europe and various colonies requiring fertilizer, e.g. the sugarcane fields of Mauritius and the Caribbean. During this period an indigenous group also briefly settled at the water near Saddle Hill to exploit the opportunity for trade.

Beef, wood and water were in considerable demand by visiting ships. Livestock was exchanged for glass trade beads, porcelain, and a variety of other goods. Near Walvis Bay the missionary Archbell reported a number of settlements in 1822, some of them with over 300 households. The Nama-speaking people at Walvis Bay were at the centre of the local trading network that extended as far as Botswana to the east. Expansion of settler influence in the Cape to the south, however, caused various Nama-speaking groups, called Oorlam Nama, to emigrate from the Cape at the beginning of the 19th century. These Oorlam Nama had absorbed considerable cultural information from their European neighbours, including the use of guns, horses and wagons that rapidly resulted in them dominating the interior of Namibia as far as Angola through their superiority in having firearms and horses.



Figure 2.b.4: Access to and transport of water have always provided the large challenge in the Namib Sand Sea (Schneider)

One of the Oorlam Nama groups settled at Bethanie in the Karas Region in 1814. A local entrepreneur, Vleermuis, lost no time in establishing a trading route to Lüderitz Bay. Though the trade briefly collapsed in 1822 and Bethanie was abandoned, it resumed again in the mid 1830s. That




trade was possibly one of the reasons for the disparate Nama families at Bethanie to coalesce as a tribe under chiefs Frederiks and Vleermuis. Other Oorlam groups that also immigrated early in the 19th century raided livestock throughout the interior of Namibia to supply their overland trade with the Cape for ammunition and more guns and horses. Thus in the early 1830s, the ≠Aonin were thoroughly defeated and dispossessed of almost all their livestock to become vassals of the Afrikaner Oorlam Nama. When the explorer James Alexander reached the middle Kuiseb and ≠Aonin homesteads in 1837, they had very little livestock of their own. Alexander was also the first European explorer along the interior margin of the Namib Sand Sea, travelling down the Tsondab River and then along the interior margin of the dunes to the Kuiseb River. The number of missionaries, explorers and traders continued to grow from the 1840s, contributing to a decline of the coastal trading routes in preference for overland trade with the Cape Colony in South Africa. The Witbooi Oorlam tribe, which settled in 1863 at Gibeon in the Hardap Region, replaced the Afrikaner tribe as the dominant Nama group in the southern interior of Namibia. They continued the tradition of large-scale livestock raiding to feed the demand for guns, ammunition and horses. That period of emergent African politics came to an end in 1882 when Chief Frederiks in Bethanie inadvisably leased Lüderitz and the adjacent coast, most of which consisted of 'worthless' sand dunes, to a German trader. That opened the door for Germany to join the rush of European nations claiming overseas colonies.

The occupation of Namibia by Germany in 1884 resulted in a steady decline in the economic self-sufficiency of all indigenous Namibian people. The new colonial masters first usurped and subverted intertribal trading mechanisms before totally disenfranchising and decimating local societies through a series of devastating colonial wars. Walvis Bay, a British possession, became marginalised as the German colonial authorities developed harbours at Swakopmund to the north and Lüderitz in the south. The ≠Aonin subsisted through an impoverished lifestyle on the periphery of the new economic reality. Those further away up the Kuiseb were able to continue farming with livestock and kept up some degree of seasonal exploitation of different resources along the Kuiseb, while those still living at Walvis Bay became more sedentary and subsisted on the !nara harvest, fishing and scavenging. This internal inequality resulted in the livestock herders becoming known as the !Khuisenin, or Kuiseb people, and the coastal group in the vicinity of Walvis Bay as the Hurinin or sea people.

During World War I, the German colonial period was brought to a close in 1915 when South African troops invaded the territory through Lüderitz and Walvis Bay and forced the surrender of the German forces. During the Treaty of Versailles and the establishment of the League of Nations, a mandate to administer the ex-German colony passed to South Africa. After long years of a bitter independence struggle, Namibia eventually gained its independence in 1990. However, Walvis Bay and the offshore islands, some only some hundreds of meters from the Namib Sand Sea coast, remained in South African hands. The colonial chapter was finally closed in 1994 when Walvis Bay and the islands off the Namibian coast were reintegrated into the Republic of Namibia.

Industrial history: An enduring myth of the Namib Sand Sea is of fabulously rich diamond fields. This dates to 1908 when the first diamond was found to the east of Lüderitz. Anybody who could afford to buy a prospecting license flocked to the desert south of the town. The pegging of claims was chaotic. In response, the German government proclaimed the area between 26° south and the Orange River, and from the coast to 100 km inland, off limits for diamond prospecting (the so-called Sperrgebiet).



The sole rights were consolidated under a single company rather than continuing with the haphazard pegging of thousands of claims by different individuals. This also gave the German government an opportunity to exploit the newly discovered riches.

The outraged prospectors turned their attention to the Namib Sand Sea north of Lüderitz. Within three months after the Sperrgebiet was proclaimed, some prospectors discovered the first few diamonds at Spencer Bay. By 1910, more than 5,000 claims had been registered to virtually cover the entire Spencer Bay area. Access to the 'northern fields' was by foot, ox wagon, mules, horses and camels. A few springs provided some water, later supplemented in 1913 by four drilled wells and a windmill to the east of Conception Bay. Large quantities of fodder and all food, fuel, construction materials, and household necessities had to be imported. Labour to work the claims was an additional challenge. Initially workers were recruited from adjacent areas, but these labourers returned home during the !nara harvesting period and to tend their farms during the rainy season. Workers were then recruited from northern Namibia to live under atrocious conditions. Their meagre rations were mostly eaten half raw for lack of firewood, which made it more difficult to digest and not very nutritious. Minimal medical supplies, the hard work and the lack of a balanced diet resulted in extremely high mortalities for man and beast on the northern diamond fields.



Figure 2.b.5: The wreck of the *Eduard Bohlen* lies hundreds of metres inland at Conception Bay (Schneider)

Prospectors in search of food eliminated most game, if not all, that occurred along the coast. Some species such as oryx and ostrich eventually recovered, but the springbok that were exterminated along the coast never returned. Following the pattern set by mariners, the prospectors and miners used any kind of wood they could find to construct shacks or to burn as fuel. Shipwreck remains were particularly useful, but also the

claim beacons of fellow prospectors. Particularly notorious accounts of the wreck of a sailing ship that was blasted into tinder with dynamite, a shipwreck at Meob Bay dismantled by workers to build shacks, and boards from shipwrecks used to stabilize the sandy walls of wells dug at Fischersbrunn illustrate the demand for wood. Even the masts and wood panelling of the cabins of the steamer *Eduard Bohlen* that stranded at Conception Bay in 1909 while transporting mining equipment were used as fuel. Today the wreck of the *Eduard Bohlen* lies hundreds of metres inland from the beach and is a major tourist attraction as a manifestation of the constantly changing shoreline. This demand for wood virtually cleared the beaches north of Lüderitz of shipwreck remains that may have been useful to reconstruct the maritime trade history.



At the outbreak of World War I in 1914, the diamond fields ceased operations. Approximately 30,000 carats had been recovered by then. Vast areas between Conception Bay and Meob Bay were systematically prospected and mined when production re-started in April 1921. The diamondiferous gravels of these deposits resulted from past sea level changes and therefore occurred in isolated patches in shallow depressions. Mining concentrated on surface workings and the thin surface deposits were quickly exhausted with very little potential of diamond-bearing sediment remaining today. Operations by the Consolidated Diamond Mines (CDM) were abandoned at the end of 1930 and Namaqua Diamonds in 1931. At that point total output from the northern fields amounted to some 579,734 carats from the Conception Bay fields and 14,763 carats from the Meob Bay fields. The South African government already had problems controlling this vast region, therefore it proclaimed the area as Diamond Area No. 2 and closed it for prospecting and mining, though claims at Saddle Hill that were registered just days before the closure were still honoured.

The Great Depression of 1929 and the global economic crisis constrained mining at Saddle Hill until 1941 when World War II caused diamond prices to soar. The area quickly developed into a hive of mining activities using massive equipment. The large demand and excellent prices for diamonds enabled the 'Industrial Diamonds of South Africa' company to operate despite the expense of mining in such a remote area. The deposit was eventually mined out in 1963 after more than 300,000 carats were produced between 1931 and 1963. Extensive prospecting along the coast from 1951–1957, 1962–1969, and 1975 through intensive mapping, geophysical studies, sampling and drilling exercises proved that only very small potential deposits remain. The area was eventually included in the Namib-Naukluft Park during the late 1980s.

During these mining years, sprawling encampments with stores, workshops and rudimentary shacks developed at the 'Grillenberger', 'Charlottenfelder', 'Holsatia' and 'Fischersbrunn' fields. Cutlery, crockery, tools and other debris of daily life still clutters these old settlements. The crumbling structures, abandoned transport and disintegrating industrial debris such as sieves and jigs are gradually succumbing to the encroaching sands. Visiting these abandoned infrastructure and industrial waste dumps has become a key attraction for the burgeoning adventure tourism concession industry.

Namib-Naukluft Park: The Namib Sand Sea occupies a major part of the Namib Naukluft Park. Since the park's early proclamation on 22 March 1907, sand dunes immediately south of the Kuiseb River were included but Sandwich Harbour was only integrated into more precisely delineated park boundaries in 1941. The eastern frontier of the then Namib Desert Park was extended to the boundaries of commercial farmland as well as southward to north-west of Solitaire in 1962. A third expansion on 1 August 1979 amalgamated the conservation areas of the Namib Desert Park, Naukluft Mountain Zebra Park and uninhabited state land into the 23,340 km² Namib-Naukluft Park. The park was expanded again in 1986 when fragments of State Land, all of Diamond Area No. 2 and parts of Diamond Area No. 1 north of the Aus-Lüderitz road were also included. With these additions of extensive conservation area the Namib-Naukluft Park reached its current size of approximately 50,000 km² of which 30,777 km² comprise the nominated Property.





Justificación



A striking display of the two Namib Sand Seas, with the Sossus Sand Formation superimposed on the Tsondab Sandstone Formation (Paul van Schalkwyk)



3

Justification for Inscription

The Namib Sand Sea stretches along the central Namibian coastline at the heart of the Namib Desert, a cool coastal desert extending for more than 2,000 km along the waterless South Atlantic coast of Africa. The Namib Sand Sea, exemplifying exceptional stark beauty and magnificent dune-scapes, is a notable and striking global feature. The incredible contrast between the Namib Sand Sea, the ephemeral Kuiseb River and the northern gravel plains inspired one of the first hand-held photos of earth to be taken from space. The complex and dynamic mosaic of distinctive and spectacular dune-scapes representing the Namib Sand Sea is being forever modified by strong winds that continually shift and mould the loose sand into dunes of myriad sizes and morphologies. The relatively narrow Namib Sand Sea extends for almost 300 km along the desolate coastline, while the eastern boundary is roughly located at 100 km inland, along the 100 mm rainfall isohyet, 1,000 metres above mean sea level. Rainfall increases from virtually nothing on the coast to further inland and from south to the north across the Namib Sand Sea. Seasonality shifts from winter in the south to summer in the north – if any rain falls at all. The life-supporting fog moisture decreases away from the coast. The ragged inland border of the Namib Sand Sea runs parallel to the Great Western Escarpment from whence ephemeral watercourses originate. This eastern frontier of the Namib Sand Sea presents an outstanding example of rich integrated geological and biological desert habitats.

The Namib Sand Sea's desert scenery and natural beauty, as well as its large dunes, are the result of on-going geological processes. The extreme aridity imposed by the cold Benguela upwelling and the constant supply of beach sand it delivers, which is then mobilized and transported inland by wind, is an outstanding example of the interaction between some of earth's major processes. These encompass atmospheric, marine, and terrestrial forces and the resultant geo-morphological, ecological and evolutionary processes that are shaped by those primary determinants. Moreover, the exceptional visibility resulting from the virtual absence of moisture, dust and atmospheric pollution in its hyper-arid climate contributes to remarkable clarity of landscape features by day and the dazzling Southern Hemisphere sky at night.



The diversity of endemic life forms that have evolved and adapted to the Namib Sand Sea is unique in the world as sustained by the ecological and biological processes within the hyper-arid terrestrial ecosystem. Investigations into this diversity, particularly the outstanding behavioural and physiological adaptations needed to sustain life under extreme conditions, have advanced and inspired theoretical and applied science globally. These studies, and the fascinating community dynamics of Namib Sand Sea endemics, have made an unrivalled contribution to the universal understanding of desert ecosystems and evolutionary processes, not only for scholars, but also in households by attracting the attention of the world's print and electronic media. The *in-situ* conservation of this array of endemic communities within their natural habitat of the Namib Sand Sea has been ensured and improved over more than a century of protection and conservation management of one of the world's outstanding desert environments.

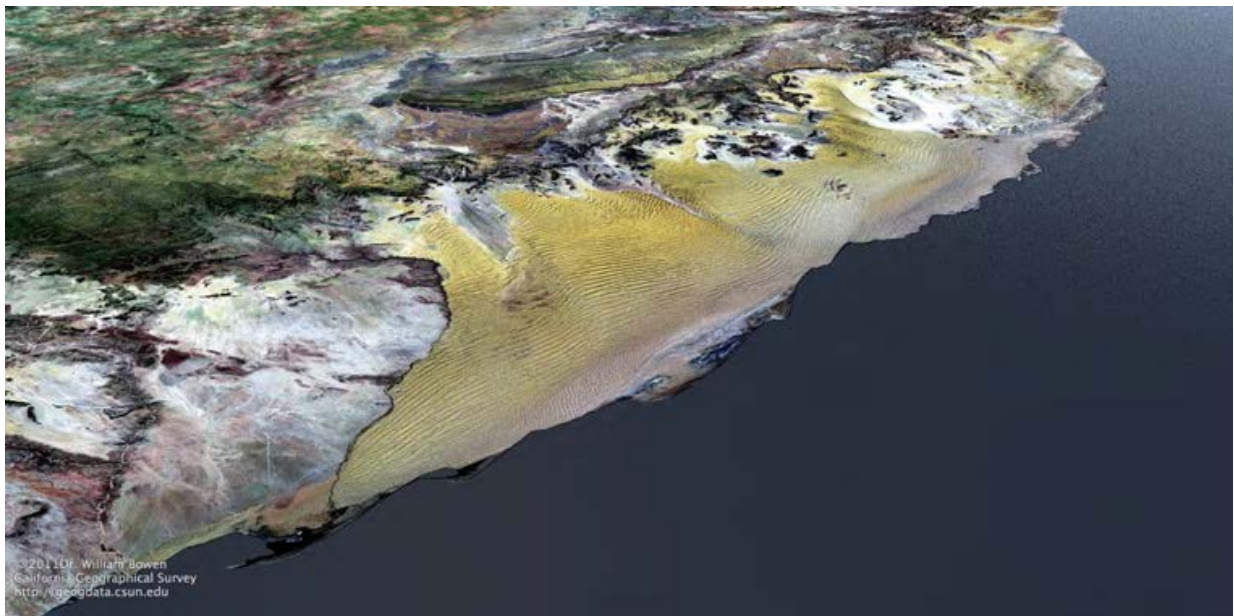


Figure 3.1: The vast extent of the Namib Sand Sea along the west coast of southern Africa lying between the southern Atlantic Ocean and the Great Western Escarpment (Bowen/NASA)

3.a CRITERIA UNDER WHICH INSCRIPTION IS PROPOSED

This proposed inscription addresses four criteria for natural properties: Criteria vii, viii, ix and x. All are important in the realisation of the Outstanding Universal Value.

Criterion vii: contain superlative natural phenomena and areas of exceptional natural beauty and aesthetic importance.

The Namib Sand Sea embodies vast panoramas of majestic dunes in a pristine environment, providing extraordinary natural desert vistas. Countless photographs and paintings by professionals and amateurs alike, adorning calendars, coffee table books, travel magazines and panoramic wall hangings, complemented by creative innovations ranging from jewellery to crafts to films of all descriptions, attest to the Namib Sand Sea's exceptional natural beauty, inspirational stimuli and aesthetic appeal (Table 3.a.1).

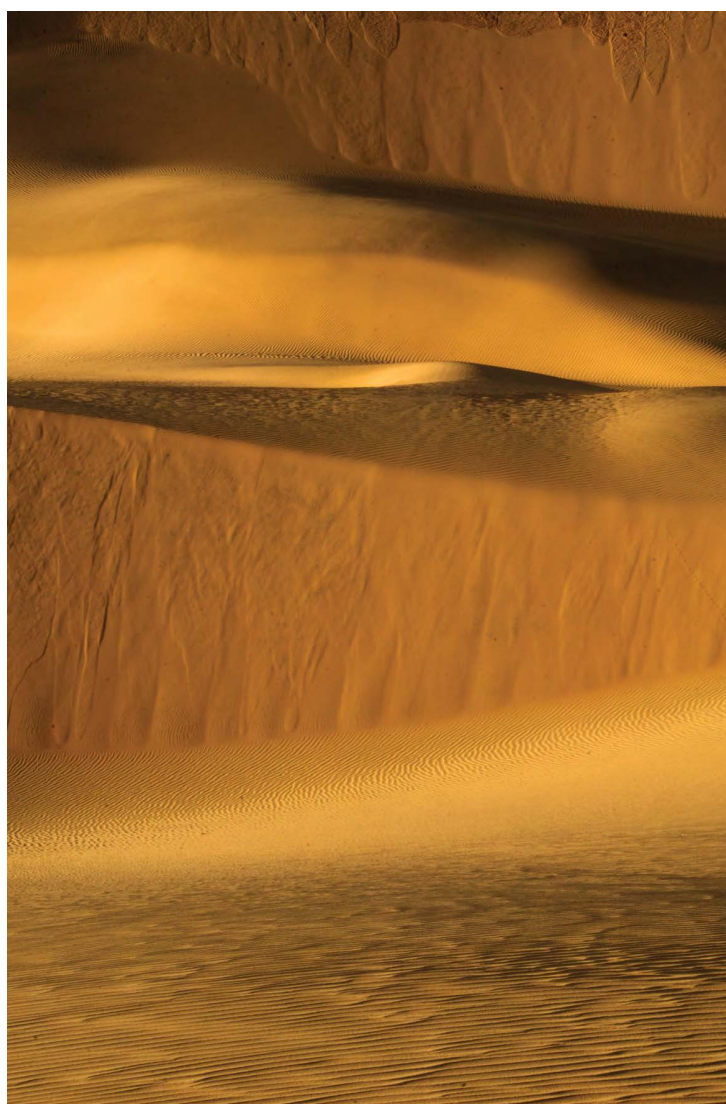


Figure 3.a.1: The interplay of light and shadow on the dunes inspires the artistic soul in all of us (van Schalkwyk)



The Namib Sand Sea boasts gigantic dunes and, while it may forever be disputed where the highest active dunes in the world occur, the Namib dunes are without doubt the largest most accessible dunes on earth. There is nowhere else in the world where dunes of this magnitude are in such easy reach of people, within a leisurely morning drive in a family sedan car. Other comparably large dunes are located in the centre of vast deserts, requiring lengthy and strenuous desert expeditions, thus limiting access to a very few privileged visitors or local residents.

The spectacular desert scenery and incomparable natural beauty of the large dunes of the Namib Sand Sea provide for extraordinary desert panoramas, complemented by the aesthetic charm of its striking colours and fascinating animal life. The interplay of shadow and light in a variety of shapes, from the detail of individual sand grains and bizarre life forms to the plethora of dune types and vast picturesque views of majestic dunes, is an endless source of fascination as the time of day, the season, the weather conditions, and the perspective of the observer compel ever-changing spectacles. This natural beauty is further enhanced by the remarkable clarity of landscape features by day and the dazzling Southern Hemisphere sky at night.

Astonishing desert vistas, profusely crystallised in silhouetted forms with fascinating kaleidoscopic sceneries continually transformed with time, make the landscape of the Namib Sand Sea a sight to behold. Its striking colours range from black to garnet to red to deep orange to light yellow in an interplay of contrasting shadow and light. The colours together with diverse, fascinating plant and animal life, bestow a distinct natural beauty and aesthetic charm. The visual splendour of the Namib Sand Sea is enhanced by the sinuous curves and shapes constantly being remodelled by wind.

The ever-changing wind directions and forces in the Namib Sand Sea create a continuously evolving landscape. Depending on the time of day, fog may cover this surprisingly variable dunescape in a chilly white-grey blanket, allowing for diverse life in unexpected forms to survive in this barren and seemingly hostile environment. This ever-returning, life-giving phenomenon of fog is one of the wonders of the Namib Sand Sea. The seemingly endless undulating dunes of the Namib Sand Sea are brought to an abrupt termination in the north by intermittent flow of the ephemeral Kuiseb River. Its occasional violent floods following on high rainfall further inland, far from the Namib Sand Sea, will forever thwart the dunes from crossing its course and penetrating the Namib gravel plains beyond.

However, the Namib Sand Sea is not limited to magnificent dunes, where winds continually drift and mould the loose sand into dunes of innumerable scales and forms. Another manifestation of its stark beauty is in the startling contrast of habitats that can be found directly adjacent to each other within the Namib Sand Sea. These create an extraordinary juxtaposition of natural living environments with their associated multitudes of life forms on its sand dunes, dry riverbeds, interdune valleys and inselbergs.



Table 3.a.1: Books and films portraying the Namib Sand Sea

Prominent examples of print media and film portraying the Namib Sand Sea
International and local photographers: Tony Bannister, Gerd Behrens, Joh Henschel, Peter Johnson, Richard Muller, Paul van Schalkwyk, Helmut zur Strassen, numerous amateurs.
International and local painters: Keith Alexander, Dieter Aschenborn, Arnfried Blatt, Johannes Blatt, Alice Elahi, Wolfgang Henkert, Fritz Krampe, Christine Marais, Barbara Pirron, Heinz Pulon, Nico Roos, Armin Sander, Otto Schroeder, Ulrich Schwanecke, Anita Steyn, Koos van Ellinckhuizen, Jochen Voigts, Konrad Zander, numerous amateurs.
Natural history books: Henschel, Dausab, Moser, Pallett - !Nara: fruit for development of the !Kuiseb Topnaar; Lovegrove – Living Deserts of Southern African; Schneider – Roadside geology of Namibia; Seely – Natural History of an Ancient Desert; Seely – Deserts: illustrated library of the earth.
Coffee table books: Coulson – Namib; Johnson, Bannister – Africa’s harsh paradise; Levinson – Diamonds in the desert; McClain, Brain – Leonard the landrover; Mertens – Namib; Rothmann – More than grains of sand; Schneider – Treasures of the diamond coast; Seely, Pallett – The Namib: secrets of a desert revealed; Swart – Landscapes of Namibia; Sycholt – Journey across the thirstland; zur Strassen – Land between two deserts; zur Strassen – Namib: portrait of a desert.
Text books with high proportion of Namib Sand Sea material: Lancaster N 1989 The Namib Sand Sea (AA Balkema); Lancaster N 1995 Geomorphology of desert dunes (Routledge); Louw GN, Seely M 1982 Ecology of Desert Organisms (Longman); Miller R 2008 The geology of Namibia Vol. 3 (Geological Survey, Namibia); Polis GA (ed.) 1991 The ecology of desert communities (University of Arizona Press, Tucson); Seely M (ed.) 1990 Namib Ecology (Transvaal Museum, Pretoria); Seely M, du Toit DR, Marsh AC (P McGladdery, ed.) 1992 Life Science, Grade 8 – Manual, Workbook and Teachers’ Guide (Gamsberg Macmillan).
International and locally generated calendars: Gerd Behrens, Dirk Heinrich, Richard Muller, Heinz Pulon; numerous wall hangings and carpets with sand dune theme woven of local karakul wool.
Travel books and magazines with the Namib Sand Sea frequently on the cover: Flamingo (NamibAir) - monthly; Lonely Planet; Travel Namibia; Namibia Holiday & Travel; monthly supplement Allgemeine Zeitung, Windhoek.
Natural history films: Anglia Television – Strange Creatures of the Skeleton Coast; BBC – Dune; BBC – Earth Enchanted Kingdom (3D); David Attenborough – Deserts of the world; National Geographic/Discovery Channel – Shifting Sands of Namib; numerous films by Japanese and other international film makers.
Feature films: 10,000 BC; Flight of the Phoenix; Space Odyssey 2001; The Cell 1; Julius Cæsar; numerous product promotion films.
Traditional knowledge records: film record by Botelle, Kowalski - Living on the edge; Kinahan – By command of their lordships; Kinahan – Pastoral nomads of the Namib Desert; van den Eynden, Vernemmen, van Damme – Ethnobotany of the Topnaar.




Criterion viii: is an outstanding example representing major stages of earth's history, significant ongoing geological processes in the development of land forms, and significant geomorphic and physiographic features.

Two dune systems are present in the Namib Sand Sea. The older is semi-consolidated and as old as 21 million years. The younger is unconsolidated and has been active for about 5 million years. It covers the older system and is still accumulating. However, neither erg has been derived from the underlying hard rock basement. Although having accumulated in the arid to hyper-arid central Namib, these dune sands originated under the humid conditions of central to eastern South Africa in the catchment area of the Orange River and its main tributary, the Vaal River. Three contrasting “conveyor belt systems,” acting in unison over much longer than the 21 million years recorded by the fossils in the basal aeolianites, namely the fluvial transport of the Orange River itself, a coastal long-shore drift and the coastal on-shore winds, finally deposited the sands in the central Namib. Thus, both the palaeo and the extant Namib Sand Seas are displaced aeolian derivatives of the huge inland Orange/Vaal River Basin.



Figure 3.a.2: Two superimposed dune systems transposed over thousands of kilometres by river, sea and wind (van Schalkwyk)

The Namib Desert is one of the oldest deserts on earth. The question of desert antiquity in various parts of the world is continuously debated as new evidence is discovered and new methodologies are applied. What is known is that the area occupied by the Namib Sand Sea, and its underlying precursor dunes known as the Tsondab Sandstone, apparently has not been any wetter than semi-arid for approximately 130 million years. Initially the present locality of the Namib Desert occupied the centre of Gondwanaland, where it formed part of the largest inland desert in the middle of a large




continent. Continental drift then split this ancient desert in two and the eastern portion became firmly established as the contemporary Namib Desert at least 32 million years ago. The post-Gondwana erosion surface joined the late Precambrian bedrock at an angle to form an extensive platform known as the Namib unconformity surface on which the Cenozoic deposits later accumulated. Presently, the original Namib peneplain enfolds the large sand sea at the verge of the African continent. The area's aridity is caused by its location under the atmospheric high-pressure zone (latitude 30°S), amplified and intensified by the Benguela upwelling system along the western coast. Thus the terrestrial Namib Sand Sea represents an uncommon interaction between the hot desert and cold oceanic conditions. In an endless interplay between upwelling cold waters and strong winds blowing onto the coast, aridity is perpetually preserved.

One of the illuminating aspects of the Tsondab Sandstone underlying the Namib Sand Sea, elucidating the evolution of these land forms, is the presence of trace fossils with direct parallels in the modern Namib Sand Sea. These include passageways and chambers of termites, root casts resembling present day grasses and other iconic dune plants as well as back-filled, burrow-like tracks that resemble those of the present day golden mole. Of major importance explicitly revealing the history of the sandstone layers is an evolutionary sequence of distinctive and readily identifiable eggshell fragments of ostrich-like birds. The oldest fragments at the bottom of the Tsondab Sandstone represent an emu-like bird not unlike the giant *Aepyornis* that occurred on Madagascar. This sequence is overlain by sequences indicated by eggshell fragments from eight different ostrich species assigned to three different genera and covering 16 million years. Not only are these varied shells interesting from an evolutionary perspective, they provide a unique series of well-preserved fossil remnants exceptionally useful to date and interpret terrestrial deposits underlying the modern Namib Sand Sea.

The ancient and modern desert dune-scapes have been and continue to be sustained by sand delivered through an amazing natural conveyor belt system. This system transports sand for almost 1,000 km from the central interior of southern Africa to the Namib Sand Sea. Sand is first washed from the Lesotho Highlands down the Orange River into the Atlantic Ocean and onto what should be the Orange River delta. The long-shore drift augmented by the Benguela Current then takes over, however, and sweeps the sands northwards and onto shore. Strong winds transport the sand inland and further north, first forming barchans and small transverse dunes then transforming them into larger transverse and longitudinal dunes to the north and east that morph into star dunes further inland.

Within the Namib Sand Sea, several inselbergs crop out of their sandy surroundings, providing a harsh contrast in ecosystems and fascinating but crucial habitats within the dunescape. These inselbergs (literally meaning 'island mountains') divert the flow of sand and create diverse, unexpected dunescapes. Rocky outcrops such as the Hauchab and Guinasib Mountains impede prevailing southerly winds, causing sand deposition and thus dune formations to curve around these obstacles. At the same time the inselbergs intercept fog and rainwater which flow off the bare expanses of rock to accumulate in cracks and crevices and support a richer fauna and flora than the surrounding dunes and desert plains. Similarly the gramadulla landscape towards the north-eastern extremity of the



identified Property provides incredible habitats and spectacular views augmenting the core area of the sand sea.

The complex dune systems of the Namib Sand Sea have been developing since the late Pliocene with incredible variations in colour of the dune sands. These range from pale yellow coastal dunes, often crowned by crests of deep red coarse garnet sand or black heavy minerals, to strongly coloured, pure red dunes on the Namib Sand Sea's eastern margin. These amazing colour variations are mainly caused by progressively higher inland concentrations of iron oxide coatings on the quartz sand grains. This colour transition serves as an additional phenomenon to interpret the evolutionary history of contemporary and ancient Namib Sand Sea landscapes.

The Namib Sand Sea is responsible for the termination of two ephemeral watercourses, the Tsondab and Tsauchab, originating in the Great Western Escarpment. In contrast, a third, mightier ephemeral river, the Kuiseb, keeps the dunes at bay on the northern perimeter of the dune field. Thus sand thwarts floodwaters of the two lesser rivers flowing westward towards the Atlantic Ocean while intermittent Kuiseb floods impede the dunes of the Namib Sand Sea from extending northward onto the Namib peneplain. This ancient and continual interface of river and dune sands is repeatedly captured and well preserved within the primal as well as contemporary deposits in the lower reaches of the Kuiseb. There the Namib Sand Sea has relentlessly pushed the river northwards leaving behind fossil channels now deeply buried beneath seemingly immaculate sand dunes.

The Namib Sand Sea thus offers a universally outstanding example of aeolian landscapes created by the basal topography and pronounced seasonal changes in wind direction. Where sand is scarce and wind forces unidirectional, barchans form. Rapidly moving barchans gradually merge into massive yellow coloured, transverse dunes which further morph into orange linear, deep red star and other spectacularly shaped dunes. The moving and morphing dunes set the scene for interplay between the geomorphology and biology of the Namib Sand Sea ecosystem. As the dunes move forward across the desert surface, beetles, lizards and other small animals move along with the dunes while vegetation selectively establishes, grows, is covered and emerges again above the sand. This continues the dynamic interplay of wind, sand and life in the Namib Sand Sea.

Criterion ix: is an outstanding example representing significant on-going ecological and biological processes in the evolution and development of terrestrial ecosystems and communities of plants and animals.

The Namib Sand Sea is one of the most striking global demonstrations of the evolution and development of an arid terrestrial ecosystem. The number of diverse, superbly adapted dune-inhabiting endemic species, interacting through intricate food webs within a vivid environmental backdrop is unique relative to all other hyper-arid desert ecosystems. At first glance, the Namib may seem barren or even hostile, not readily revealing its extensive secrets. Though seemingly devoid of animal and plant life, the desert is inhabited by a surprisingly diverse and resilient biota, energized and regulated by interactions between various forces peculiar to arid zones. Not only is it composed of three different contrasting habitats (the dunes, dry riverbeds and gravel-covered interdune valleys)



but its inimitable ecosystems support all classes of living organisms. These range from plants and fungi to insects, arachnids, reptiles, birds and mammals thus allowing natural ecological interactions and processes to continue functioning in all their complexity.



Figure 3.a.3: The extreme aridity of the Namib Sand Sea is ameliorated by coastal fog and episodic rainfall events (van Schalkwyk)

Adaptation to the extremely harsh desert conditions dictates the evolution, speciation and specialisation of organisms. The fine, windblown dune sands of the Namib Sand Sea support very hot temperatures on the surface during the day with strong, direct incident radiation. Thus most of the Namib sand dune inhabitants are active in the morning or evening when surface microclimates are temporally moderate. Nevertheless, some species in the erg show exceptional physiological and behavioural adaptations to survive even the hottest conditions during the day. In addition, the high frequency of fog towards the coast has resulted in very rare behavioural adaptations to condense and harvest fog-water in these hyper-arid conditions. The abundant life in the dunes shows fascinating interactions to illustrate the relative importance of biotic constraints such as predation and competition in desert communities.

Wind blowing in the Namib Sand Sea is a daily occurrence, forever changing the landscape in an interplay of sand, wind and moisture, which sustains significant on-going ecological processes and interactions. Mobile barchan dunes carry beetles, lizards and other small animals with them over distances of tens of meters each year as they are gradually shifted around by winds. Patterns of alternating dunes, dry riverbeds and interdune valleys also have an effect on the distribution and speciation of plants and animals. Thus the Namib Sand Sea shows an amazing diversity in plant and animal life, some of which are geographically confined to relatively isolated parts of their sandy




homes. Dune movement has been on-going for millions of years and will continue indefinitely, therefore evolution and speciation in the Namib will never be a story of the past, but rather as contemporary as diurnal and seasonal changes evident in the erg.

In an undisturbed environment such as the Namib Sand Sea, structures, shapes and roles are not only conserved but also rejuvenated on a regular basis, creating new and breaking down old dune frameworks representing all stages of dune succession. The fascinating morphological, behavioural and physiological adaptations that enable a variety of endemic species to live in the Namib Sand Sea adjust continuously to the changing dunes. The astonishing specialisations, that allow for on-going ecological and biological processes in all types of dune habitats, have been studied, described and elucidated by scholars and scientists from around the world.

The Namib Sand Sea provides an outstanding study site or natural laboratory with its unique interplay of rocks, sand, wind and the cold Benguela current. This complexity makes it an internationally renowned reference area for primary examples of unravelling the evolutionary, physiological, behavioural, and ecological processes associated with desert ecosystems world-wide. Research documented in films, books, scientific papers and unpublished reports has been carried out in the Namib Desert for a century by a global array of researchers. The Namib Desert is undisputedly one of the prime locations in the world to study such contrasting habitats immediately juxtaposed to each other (sand dunes, interdune valleys, rocky outcrops, riverbeds and gravel plains). For an environment that is generally considered to be lifeless, the Namib Sand Sea always amazes those that have come to study and understand it. An anthology of research interests, topics and outputs by scientists from diverse professional fields and expertise from all different corners of the world attest to the lure of the Namib Sand Sea and its superlative array of organisms with highly specialised behavioural and physiological adaptations to the extreme desert climate. The gathered information has been broadcast globally by the world media to inform and educate the public at large about the resilience of biological communities and evolutionary processes that allow survival in extreme environments. This knowledge gained in the Namib Sand Sea also contributes significantly to understanding the threats of desertification and to developing appropriate responses to ameliorate the potential impacts of climate change. The Namib Sand Sea therefore provides insight into how humans, who are rapidly changing their own landscapes into less productive environments, could approach the future.

The inhabitants of the Namib Sand Sea have found unique and fascinating ways of dealing with arid, adverse conditions over small and large-scale, steep climatic gradients. In order to escape extremely hot or cold conditions on the sand surface, animals such as lizards, beetles and even the golden mole have evolved to quickly 'dive' or 'swim' into the loose, oxygenated sand of the Namib Sand Sea. Without having to excavate burrows, as is the case in other deserts, this swimming behaviour allows them swift escape strategies. Various microhabitats of the ever-mobile dunes in the sand sea create a plethora of ecological niches providing suitable conditions for avoidance of desert extremes. These variations contribute to the increase in number and diversity of fauna and flora of the Namib Sand Sea.

Plants have developed their own mechanisms to escape or tolerate the harsh conditions of the sand sea. Many plants adapted to the erg by becoming ephemeral or simply evolving very fleeting life



histories of rapid growth, maturation and reproduction. This usually follows infrequent, good rains. Alternatively plants have developed mechanisms to use fog as a supplementary source of moisture. The seeds of most plants, such as *Stipagrostis* grasses, can withstand exposure to very high temperatures and lie dormant for decades. Therefore, the Namib Sand Sea is not only home to numerous animals but also an important, secure although dynamic seed bank for plants.


Criterion x: contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation.

The Namib Sand Sea stretches along the coast of Namibia to form one of the most spectacular natural habitats for *in-situ* conservation of biological diversity in the world. Despite its extreme aridity, a remarkable number of endemic plants and animals have evolved in this habitat, displaying ancient adaptations to life in soft sand. The Namib Sand Sea is wholly within the borders of the Namib Naukluft Park. This park protects other areas of the Namib Desert, one of the most pristine environments in the world, first proclaimed as a conservation area in 1907 and thus counting among the oldest conservation areas in the world. The Namib Sand Sea contains many different habitats that form the basis for ecological specialisation under extreme conditions along an environmental gradient. The rich, diverse habitats are of outstanding international importance for conservation of a variety of biological creatures in their natural place of evolutionary origin with outstanding universal scientific value.

The Namib is inhabited by a surprisingly diverse and resilient biota. A large and highly diverse segment of this biota is composed of more than 250 invertebrate species, more than 80% of them endemic to either the Namib Desert as a whole or the Namib Sand Sea in particular. Many of the highly adapted endemic dune species have evolved extraordinary tolerance and responses to acute climatic and substrate variability in the shifting mobile sand of the Namib Sand Sea. The Namib dunes harbour a high proportion of plant and animal life with important and unusual characteristics linked to a climate that is typically dry, sometimes foggy, highly variable and extremely harsh.

The extraordinary endemism of living organisms in the Namib erg, as well as the outstanding and universal value that the study of their unique physiological and behavioural adaptations has contributed to science, are protected in the Namib-Naukluft Park. This park encompasses all habitats of the wind-swept dune field, from cool coastal desert to the hot, dry interior. The unbroken landscape of undulating dunes to the pediplains, of desert inselbergs and playas and of the windswept coastal plains to the stable dunes on the eastern desert margin are all well and truly represented within the nominated Property for *in-situ* biological conservation.

The Namib Sand Sea is an area of extraordinary beauty with three habitats (undulating dunes, vegetated riverine oases and hard-surfaced interdunal plains) offering life to rare and exotic animal species. Extensive and almost unbroken sandscapes stretch for a distance of approximately 300 km along the coast, and up to 120 km into the interior. Shaped by wind, sand and moisture dynamics, dunes of the Namib Sand Sea offer a variety of habitats for plants and animals. The total amount of



standing vegetation biomass able to establish and potentially fortify the structures of dunes is, in turn, determined by moisture availability. Varying degrees of dune sand stability from the base to the crest then offers a diversity of microhabitats able to support distinct fauna and flora. The end result is a complex multitude of niches exploited by an astonishing number of plant and animal organisms and thus significant natural habitats for *in-situ* conservation of biological diversity.



Figure 3.a.4: Diverse magnificent desert land forms populate the Namib Sand Sea (van Schalkwyk)



3.b PROPOSED STATEMENT OF OUTSTANDING UNIVERSAL VALUE

Brief synthesis: The boundaries of the envisaged World Heritage site, entirely within the protected Namib-Naukluft Park, encompass 3,077,700 hectares from the proximate source of sand on the coast to the final area of deposition some 100 km inland. The Namib Sand Sea along the arid African coast of the South Atlantic with its superlative, diverse, spectacular array of large, striking shifting dunes is an outstanding example of the scenic, geomorphological, ecological and evolutionary consequences of wind-driven processes interacting with geology and ecology. This Namib Sand Sea is globally unique, comprising a superimposed old and a young sand sea. The sand for both was transported by river, ocean current and wind more than 1,000 km from its source in the humid interior of eastern southern Africa. Life in the fog bathed coastal dunes of the Namib Sand Sea, and the behavioural and physiological adaptations that evolved throughout its specialist communities, are significant global examples for the evolution and development of a terrestrial ecosystem community and the resilience of life in extreme environments. The high diversity (>300 species) and endemism (>50%) of the Namib Sand Sea biota are much greater than any other known hyper-arid, sand dune ecosystem. *In-situ* conservation of communities representing the turnover of endemic species from the cool coastal desert with frequent fog, to the hot, dry interior where more extreme aridity requires different strategies for survival, is ensured by the extensive, continuous habitat types across the full climatic gradient of the Namib Sand Sea.


Justification for criteria:

vii: Outstanding natural beauty of the Namib Sand Sea

The Namib Sand Sea encompasses vast panoramas of majestic dune-scapes, strikingly crystallised in sharply silhouetted forms continually transformed with wind and time. The striking range of spectacular dune forms and colours in an on-going interplay of contrasting shadow and light, combined with diverse, fascinating and bizarre plant and animal life, bestows a superlative, distinct natural beauty and aesthetic charm.

viii: Active geological processes of global significance

The Namib Sand Sea is composed of two superimposed dune systems, one semi-consolidated as old as 21 million years, the younger unconsolidated and active for about 5 million years, neither eroded *in situ* from the underlying substrate. Three contrasting, on-going sedimentary 'conveyor belt systems', the fluvial transport of the Orange River, a coastal long-shore drift and coastal on-shore winds, finally deposited the palaeo and modern dune systems in the Namib Sand Sea – representing outstanding geological processes of global significance. The Namib Sand Sea presents a universally outstanding example of extraordinary aeolian landscapes relentlessly sculpted by the basal topography and pronounced daily and seasonal changes in dominant wind directions. Remarkable examples of on-going desert geomorphic and physiographic features such as inselbergs isolated by encroaching dune fields, relict topography and sedimentary deposits from past climatic changes, endorhaeic river-end pans and exemplars of most desert geomorphic features are resplendently displayed in the Namib Sand Sea.



ix: On-going natural ecological dynamics that drive the evolution and interaction among Namib Sand Sea fauna and flora

The number of diverse, superbly adapted dune-inhabiting endemic species, in a hyper-arid environment with low net primary productivity, interacting through intricate food webs within a vivid environmental backdrop in the Namib Sand Sea is unique relative to all other hyper-arid desert ecosystems. The high frequency of fog towards the coast has given rise to very rare behavioural adaptations to condense and harvest fog-water in these hyper-arid conditions. In parallel, the well-oxygenated subsurface sand offers swift escape strategies from arid extremes for 'swimming' and 'diving' invertebrates, reptiles and mammals. Myriad microhabitats of the ever-mobile dunes of the Namib Sand Sea create a plethora of ecological niches for bizarre and fascinating ways of dealing with arid, adverse extremes over small and large-scale, steep climatic gradients.

x: Extraordinary diversity of endemic species of special significance to science and environmental understanding

The Namib Sand Sea imparts an unfragmented and pristine environment along a vast range of macro- and micro-climatic and habitat conditions that sustains a vast genetic diversity of species. These rich, diverse habitats are of outstanding international importance for conservation of a variety of diverse biological creatures in their natural place of evolutionary origin with confirmed, outstanding universal scientific value. The Namib Sand Sea exemplifies one of the most extensive, spectacular protected natural habitats for *in-situ* conservation of hyper-arid biological diversity in the world. More than 50% endemism, in some groups over 75%, in the more than 300 species of plants, invertebrates and vertebrates is safeguarded within the sand sea that covers 84% of the Property. Well-documented results from on-going scientific research and long-term monitoring are readily available to explain the biodiversity, ecological relationships and fluctuations in species presence and population changes. The Namib Sand Sea is wholly protected within the borders of the Namib-Naukluft Park with its long-term management programme and allocated funding.

Statement of integrity: The Namib Sand Sea is essentially a pristine environment within the borders of the Namib-Naukluft Park. The extensive dune-scapes are unspoilt and continuously refreshed and maintained by wholly natural processes. Permanent visitor and management infrastructure is non-existent within these boundaries and temporary occupation is restricted to small, temporary point locations that have no measurable effect on the well-known and well-researched geological, geomorphological, ecological, and biological processes of the Namib Sand Sea.

Requirements for protection and management necessary to maintain potential outstanding universal value: The 100-year long history of exclusionary regulations followed by conservation management interventions has informed and is available to inform future decisions about maintaining ecosystem processes not undermined by human exploitation. The Namib Sand Sea has been under conservation management for more than 50 years with well-established management and resource allocation systems, based upon a regularly revised and updated management plans and long-term budgetary planning. Key management issues today include managing the increasing demand for visitor access to pristine areas and precluding mineral exploration rights that would impact on the values and attributes of the area.

3.c COMPARATIVE ANALYSIS (INCLUDING STATE OF CONSERVATION OF SIMILAR PROPERTIES)

As an ancient, fog-dominated coastal desert environment, the Namib Sand Sea has no corresponding natural system on earth. The environment is produced and regulated by a cold ocean current and associated climatic conditions, is primarily characterised by hyper-aridity and is host to all major dune types and to some of the highest sand dunes in the world. The dominant wind conveyance system is disrupted by only sparsely occurring inselbergs and dry ephemeral river courses. Partly as a result of these climatic and geomorphological characteristics, the biodiversity of the Namib Sand Sea is greater than in any other dune deserts. A comprehensive analysis by Goudie and Seely¹ mentioned some but not all of the comparative areas. A more recent document entitled Namib Sand Sea Comparison by Goudie is attached as Annex 3.

Coastal fog deserts are found on five continents, namely Africa, Asia, Australia, North America and South America. However, only one of these fog deserts, the Namib, contains sand dunes of any great extent influenced by the fog. Most of the other fog deserts have coastal dunes but not a major erg within the coastal desert. The exceptions are the coastal dunes in Mauritania and Oman, both of which represent extensions of larger dune fields, the Sahara and the Arabian desert.

Table 3.c.1: Coastal fog deserts of the world bordering on cold currents or oceanic upwelling systems

Country	Fog desert	Oceanic current	Dunes*	Biota
Australia	Australia	East Indian Ocean	+	Variable states of conservation
Chile & Peru	Atacama	Humboldt Current	+	Lomas vegetation; algae, lichens, cactus; not well conserved; no management plans
Mauritania, Banc d'Arguin National Park, Ramsar, WHS	Sahara	Cape Verde upwelling	++	World's largest concentration of wintering shorebirds; Ramsar and WHS well conserved, not further inland
Mexico	Baja California	California Current	+	Xeric shrubs; not well conserved, no management plan
Namibia (includes Ramsar Site)	Namib	Benguela Current	+++	Sparse dune vegetation, diverse endemic invertebrates; well conserved
Oman & Yemen	Arabian Peninsula Coastal Fog Desert	Monsoon driven upwelling	+	Dhofar Mtns: 60 endemic plant species; large mammals & predators; no management plan

*+ = limited dune occurrence; +++ = extensive dune occurrence

¹ Goudie and Seely 2011. World Heritage Desert Landscapes, IUCN.



The Namib Sand Dune Sea is the only coastal aeolian desert underlain by a previous desert from the same external origins and having experienced the same atmospheric, oceanic and terrestrial controls. The Atacama Desert is perhaps the closest analogue to the Namib Desert with extensive fog and great antiquity.

Comparative analysis reveals one single desert, the Atacama Desert on the Pacific Coast of South America as somewhat equivalent to the Namib Desert in terms of its situation and climate. The Atacama lies in the rain-shadow of the Andes Mountains off the Chilean coast (comparable to the Great Western Escarpment of Western Namibia) and is under the influence of an inversion layer induced by the cold offshore Humboldt Current (similar to the Benguela Current influence). It too is straddling the Tropic of Capricorn and is reputedly the driest desert on earth. However, the Atacama Desert does not display the aeolian land form features of the Namib Sand Sea. In terms of biodiversity, the Atacama Desert is comparatively devoid of life and does not compare to the Namib Sand Sea with its rich array of endemic organisms.

Smaller coastal deserts elsewhere (Arabia, Australia, India, North America) are not comparable in size or ecology to the Namib or Atacama Deserts. Similar desert ergs with vast dune landscapes occur elsewhere in the world and include the Arabian, Gobi, Sahara and TaklaMakan Deserts. However, only a few localities in middle-eastern desert landscapes of Iran, Iraq and Saudi Arabia, or the Gobi in China, boast sand dunes that may approximate those found in the Namib erg in size or height. In terms of biodiversity, the concentration of morphological, physiological and behavioural adaptation to hyper-arid dune habitats as found in the Namib erg is unmatched by any other aeolian desert systems in the world. This is coupled to the high degree of endemism among the Namib dune field's biotic communities and thus the ecology of the area.

The scientific contribution that has been made by scholars studying the diverse geological, geomorphological, ecological and evolutionary processes of the Namib erg is outstanding. It continues to be augmented by ongoing work at the world-renowned Gobabeb Training and Research Centre on the northern banks of the Kuiseb River that form the northern edge of the nominated Property. Most other desert research is conducted by university research groups or institutions, which do not have facilities with long-term researchers situated within the desert. The exceptions are Australia where Alice Springs and other CSIRO-affiliated institutions are situated in the interior warm arid areas of Australia. Similarly, Repetek in Turkmenistan is a continuously occupied research station in the MAB Biosphere Reserve of UNESCO located in the cold winter desert of the East Karakum Desert.

It is evident from this overview that there are very large gaps in the coverage of desert landscapes and geomorphological features in existing World Heritage properties. In particular it is clear that the most distinctive land forms and land forming processes of deserts - aeolian features - are not reflected in the World Heritage List. This is the case for dunes, yardangs, pans, dust sources and coastal sabkhas, and this is also true for weathering forms and various types of crust, rind and varnish not directly analogous to the Namib Sand Sea. It is also true for various Quaternary phenomena (e.g. ancient river systems and pluvial lakes) and some highly important fluvial phenomena, including alluvial fans, pediments and debris flow phenomena only secondarily represented in the identified Property (Table 3.c.2).



Table 3.c.2: Biophysical elements of the Namib Sand Sea in comparison with other fog-bathed, dune deserts.

Characteristics of the Namib Sand Sea	Comments
Its fogginess, aridity and clear climatic gradient inland, which makes it an ideal dune location for testing, <i>inter alia</i> , the way in which weathering processes operate in dune deserts	No comparable examples
Its antiquity, which though not unique, is substantial	Requires further research
The ancient aeolianite erg that underlies the modern erg	No comparable examples
The three-part conveyor system which transported sand from the interior of South Africa and Lesotho to the coast and along the coast northwards and back onto land into the ancient and modern Namib Sand Seas	No comparable examples
The presence of a comprehensive suite of well-developed dune forms that make it an ideal model to study dunes in the context of a whole erg	No other dune landscape has a comparable diversity in a relatively small area
The relationships between dunes and rivers and dunes and coastal structures	No comparable examples
The pattern of colouration across the erg	No comparable examples
The size of some of its dunes, which are among the highest in the world	Not exceptional size, but especially accessible
The utility of the Namib as a model for planetary aeolian and weathering forms on Mars and other celestial bodies	Accessible but not exceptional
The long term data that are available on rates of dune crest migration	No known comparable data set

The existing World Heritage List has relatively few desert properties, and those that exist are not noted for the development of their dune forms. The proposed Namib Property has been the subject of intensive research, has been mooted as a World Heritage Site and it is apparent that in global terms it is notable for a variety of characteristics.

These same fog influenced dune forms of the proposed Namib Sand Sea Property are remarkable in global terms from an ecological point of view as well (Table 3.c.3).



Table 3.c.3: Ecological elements of the Namib Sand Sea in comparison with other fog-bathed, dune deserts.

Characteristics of the Namib Sand Sea	Comments
Its fogginess, aridity and clear climatic gradient west to east and south to north, make it an ideal location for comparative study of desert dune adaptations and physiology under different moisture regimes	No comparable examples
Its diversity of dune types, from barchans to transverse to linear to star dunes, provides a variety of habitats used differentially by elements of the dune flora and fauna	No comparable examples
Its diversity of micro-habitats across one sand dune, e.g. interdune, dune base, plinth, slipface, crest makes available a variety of niches for zonation of dune flora and fauna	Microhabitats not exceptional but associated fauna with no known comparable examples
The apparently unique absence of very fine silt among the sand grains allows diffusion of sufficient oxygen beneath the sand surface to support the evolution of a multiplicity of 'sand swimming' fauna that do not use burrows	No comparable examples
The juxtaposition and long-term variability of dunes, ephemeral rivers, inselbergs and underlying Tsondab Sandstone provided the basis for evolution of a highly endemic fauna and flora over aeons	No comparable examples
The juxtaposition of dunes, ephemeral rivers, inselbergs and underlying Tsondab Sandstone provides further opportunity for comparative studies as well as investigations of biogeographic interactions among fauna and flora based in the different habitats	Exceptional opportunities with no comparably diverse examples
The presence of ancient aeolianite erg of Tsondab Sandstone underlying the sand dunes provides an almost continuous long-term record of dune biota presence and evolution in the Namib Sand Sea	No comparable examples
The long-term monitoring results pertaining to climate, vegetation, invertebrates, birds and mammals, and ongoing research at the Gobabeb Training and Research Centre provide a firm background for evolving research topics and applications	No known comparable data set

Paragraph 132 of the Operational Guidelines expects “A comparative analysis of the property in relation to similar properties, whether or not on the World Heritage List, both at the national and international levels, shall also be provided. The comparative analysis shall explain the importance of the nominated property in its national and international context.” This is expected to be carried out for each individual criterion. The above summary highlights the main elements of why the Namib Sand Sea is special, particularly in terms of other sites inscribed as World Heritage for each of the criteria for which the Namib Sand Sea are being nominated.

Criterion vii: The World Heritage List contained 131 properties with 6 transboundary properties inscribed under this criterion in 2011. As “exceptional natural beauty and aesthetic importance” is such a ubiquitous value for almost any site that may be considered for nomination and is a special



attribute of hyper-arid desert landscapes, it was not feasible to consider sites on the tentative lists of state parties for comparison. It is accepted that almost any desert landscape to be nominated will have attributes expressing exceptional natural beauty as is the case for the Namib Sand Sea. Particularly relevant are inscribed desert sites that include: Tassili n'Ajjer, Uluru-Kata Tjuta National Park, Wadi Rum Protected Area, Cliff of Bandiagara (Land of the Dogons), and Grand Canyon National Park. Of these, only the Grand Canyon does not include sand dunes as an attribute (Table 3.c.4). The scenic beauty of the dune morphology sites specifically inscribed for this criterion as well as areas with dunes listed in Table 3.c.1 will have many attributes similar to that of the Namib Sand Sea. The scenery resulting from superlatively sized dunes as in the Namib Sand Sea is, however, not represented in any site currently inscribed under Criterion vii.

Table 3.c.4: Comparison of the Namib Sand Sea with desert World Heritage Sites inscribed under Criterion vii

Country	Name of Property	Dunescapes
Australia	Uluru-Kata Tjuta National Park	Yes
Jordan	Wadi Rum Protected Area	Yes
Mali	Cliff of Bandiagara (Land of the Dogons)	Yes
Niger	Air and Ténéré Natural Reserves	Yes
USA	Grand Canyon National Park	No

A popular aspect of the Namib Sand Sea used for marketing is the size of the dunes, purportedly ‘the highest dunes in the world’, but also under Criterion vii for “*superlative natural phenomena*”. The superlatively sized dunes of the Namib Sand Sea are not the highest dunes in absolute terms (Table 3.c.5), though their unparalleled accessibility allows visitors to fully appreciate that size. None of the sites in Table 3.c.5 has been inscribed and only the Namib Sand Sea has been nominated.

Table 3.c.5: Dune height in the Namib Sand Sea in comparison with other massive dunes

Height (m)	Country	Desert	Location	Comments
1176	Peru	Sechura Desert	Cerro Blanco	Stationary dune
500	China	Gobi Desert	Badain Jaran	Stationary dunes
470	Iran	Lut Desert	Rig-e Yalan Dune	Unstable dunes
465	Algeria	Sahara Desert	Tifernine Sand Sea	Unstable star dunes
380	Namibia	Namib Sand Sea	Sossus Vlei	Unstable star dunes
280	Australia		Mount Tempest, Moreton Island	Stationary coastal dune
230	USA	Great Sand Dunes National Park	Star Dune	Stationary dunes, clay rich
105	France		Pilat Dune	Stationary coastal dune
200	China	Taklamakan Desert	Ming-Sha Dunes	Stationary and unstable barchan dunes
190	Mongolia	Khongorin Els	Khongor	Stationary dunes



The information in Table 3.c.5 was gleaned through an internet search using a variety of search terms and search engines (carried out 29 October 2011). Dune size comparisons between different regions of the world do not feature in geomorphological literature as the size and scale of individual dunes, including height, is determined by a range of factors such as grain size, silt and clay fraction, soil moisture, wind directions and speed, sand supply, distance from source, vegetation, basement topography, and nearby land forms. No attempt has been made to analyse any of these factors as the lack of scientific studies precludes objective comparison.

Criterion viii: The relevancy of this criterion was discussed above. The World Heritage List in October 2011 contained 80 properties with eight transboundary properties inscribed under Criterion viii. This criterion encapsulates four distinct, although closely linked, elements as discussed by Badman et al.². It is contended that the Namib Sand Sea in any context, also outside desert environments, represents exceptionally significant examples of earth's history, on-going geological processes in the development of land forms and geomorphic or physiographic features. The report by Dingwall et al.³ specifically did not systematically identify possible new sites for nomination as theme reports such as Goudie and Seely¹ envisaged. Comparison of the geomorphic features of the Namib Sand Sea with those listed in Table 3 of the latter document indicate that the Namib Sand Sea includes the majority of features (Table 3.c.6), many of which are inadequately represented in the current list of World Heritage properties. Most of the inscribed properties were listed for their fossil, erosional, or volcanic features. Only the Willandra Lakes Region in Australia has been inscribed for sedimentary deposition, in particular its pans and lunette dunes, though rather for the fossil nature of those features than as a global example or ongoing geological process. None of the inscribed sites is comparable to the Namib Sand Sea in those terms and none of the inscribed desert sites includes the range of aeolian dune types as is found in the Namib Sand Sea.

Table 3.c.6: Geomorphic features of the Namib Sand Sea and those of other inscribed World Heritage sites (after Table 3 in Goudie and Seely)

Geomorphic features	Namib Sand Sea	Other inscribed sites and locations
<i>Aeolian features</i>		
Dunes	Spectacular diversity, size and extent	Willandra Lakes Region (Australia) (small linears and lunettes), Air and Ténéré Natural Reserves (Niger), Wadi Rum (Jordan)
Yardangs	Present (small)	
Pans	Present (27.7 km ²)	Willandra Lakes Region (Australia), Península Valdés (Argentina)
Dust storms and deflation surfaces	Frequent	
Coastal sabkhas	Present	Banc d'Arguin (Mauritania)

² Badman et al. 2008. Outstanding universal value: Standards for natural world heritage. IUCN.

³ Dingwall et al. 2005. Geological World Heritage: A global framework. A contribution to the Global Theme Study of World Heritage Natural Sites. IUCN.



Weathering forms, processes and surface materials

Sodium nitrate crusts	Absent	Humberstone and Santa Laura Saltpeter Works (Chile) (cultural property)
Gypsum crusts (gypcrete)	Present	
Calcium carbonate crusts (calcrete)	Present	
Salts and salt weathering	Present (insignificant)	Wadi Rum (Jordan)
Cavernous weathering forms (tafoni and alveoles)	Present (insignificant)	Rock-Art Sites of Tadrart Acacus (Libya), Tassili n'Ajjer (Algeria) (cultural property)
Desert varnishes and rinds	Present	Twyfelfontein or /Ui-//aes (Namibia) (cultural property)
Desert karst and tufa deposition	Present (insignificant)	Purnululu National Park (Australia) (sandstone only)

Fossil lakes and other pluvial evidence

Relict weathering profiles	Present	Wadi Rum (Jordan)
Lake basins with palaeo shorelines	Absent (present around pans)	Lake Turkana National Parks (Kenya)
Ancient river systems	Present (>500 km ²)	

Fluvial and slope processes and forms

Ephemeral stream channels (wadis)	Present (29 km ²)	Grand Canyon National Park (USA)
Badlands/gramadullas	Present (953 km ²)	Dinosaur Provincial Park (Canada), Ischigualasto/Talampaya Natural Parks (Argentina) (natural sites listed primarily for fossil values)
Pediments	Present (>2000 km ²)	
Sheetflood activity	Present	
Inselbergs	Present (270 km ²)	Uluru-Kata Tjuta National Park (Australia)
Sand ramps	Present (very large)	Wadi Rum (Jordan)
Alluvial fans	Present	
Debris flows	Present	Wadi Rum (Jordan)
Groundwater sapping	Present (insignificant)	Grand Canyon National Park (USA), Wadi Rum (Jordan)
Natural arches	Absent	Rock-Art Sites of Tadrart Acacus (Libya) (cultural property), Wadi Rum (Jordan)



Criterion ix: The phrase “*significant on-going ecological and biological processes in the evolution and development of terrestrial ... ecosystems and communities of plants and animals*” could have been specially wordsmithed to describe the ecological processes of the Namib Sand Sea. The World Heritage List contained 109 properties with seven transboundary properties inscribed under Criterion ix. The Namib Sand Sea is a fogbound coastal desert, thus the delisted Arabian Oryx Sanctuary in Oman would have been the only directly comparable site. Table 3.c.3 highlights the ecological elements that resulted in the distinctive hyper-arid biota of the Namib Sand Sea. In a wider evolutionary context, the Namib Sand Sea may be considered to simply represent a desert site that should be compared with other similar sites, or that it represents an ecological ‘island’ as the only hyper-arid area in sub-Saharan Africa. Table 3.c.7 reflects other desert sites, sites dominated by sandy substrates, and sites with comparable significance in understanding evolutionary processes.

Table 3.c.7: Comparison of the Namib Sand Sea with World Heritage Sites inscribed under Criterion ix

Country	Name of Property	Process
Ecuador	Galápagos Islands	Speciation, Island ecology
Kazakhstan	Saryarka – Steppe and Lakes of Northern Kazakhstan	Wetland ecology, Ramsar Site
Mauritania	Banc d'Arguin National Park	Wetland ecology, Ramsar Site
Mexico	Islands and Protected Areas of the Gulf of California	Speciation, Desert ecology
Niger	Air and Ténéré Natural Reserves	Refugia, Desert ecology
Spain	Doñana National Park	Wetland ecology
Seychelles	Aldabra Atoll	Speciation, Island ecology
USA	Grand Canyon National Park	Altitudinal and Desert ecology
Namibia	Namib Sand Sea	Speciation, Desert ecology, Refugia, Physiological and Behavioural ‘island’ evolution, includes Ramsar Site

The Air and Ténéré Natural Reserves and Banc d'Arguin National Park are Warm Desert Biome representatives in the Afrotropical Realm (after Udvardy). The Air and Ténéré Natural Reserves have been on the List of World Heritage in Danger since 1992 and their state of conservation creates grave concern over the incessant degradation of the Outstanding Universal Value (OUV) of the Property (35COM 7A.11).

The Banc d'Arguin National Park was inscribed under Criterion ix for its wetland ecology. The boundaries of the Namib Sand Sea include a Ramsar Site at Sandwich Harbour that is considered to be a secondary attribute and therefore not compared to other similar sites. It could have been argued that the Namib Sand Sea should have been considered simply as other Afrotropical desert sites with secure conservation status not represented on the World Heritage List. However, it also represents the climatic extremes of the isolated Namib Desert Biogeographic Province which was suggested in 2004 as a future priority for a credible and complete list of natural and mixed sites (WHC-04/28.COM/INF.13B).

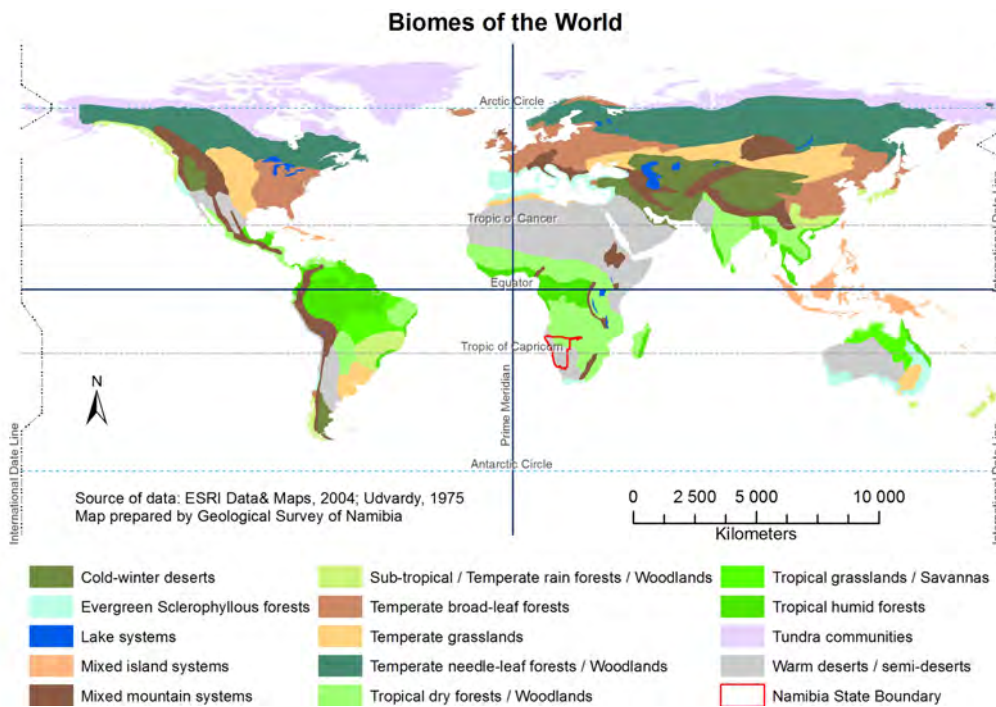


Figure 3.c.1: The Namib Sand Sea in the context of Udvardy Biomes (<http://www.fao.org/geonetwork/rv/en/metadata/show?id=1008>)

Biogeographic considerations for the Namib Sand Sea refer simply to its geographical location and associated climate. The specific attributes to carry its OUV are, however, associated with the extraordinary morphological, physiological and behavioural adaptations of a complex biota to unconsolidated sand surfaces and reliance on fog as a moisture source. It augments a suite of extraordinary natural evolutionary laboratories such as the Galápagos Islands, the Islands and Protected Areas of the Gulf of California, Grand Canyon National Park, Aldabra Atoll, Socotra Archipelago, Lake Malawi National Park and Lake Baikal. None of those sites, as is the case with the Namib Sand Sea, can be effectively compared to any other area, as their evolutionary histories are intimately bound to the ecological elements that define them (Table 3.c.3). The ecological context of

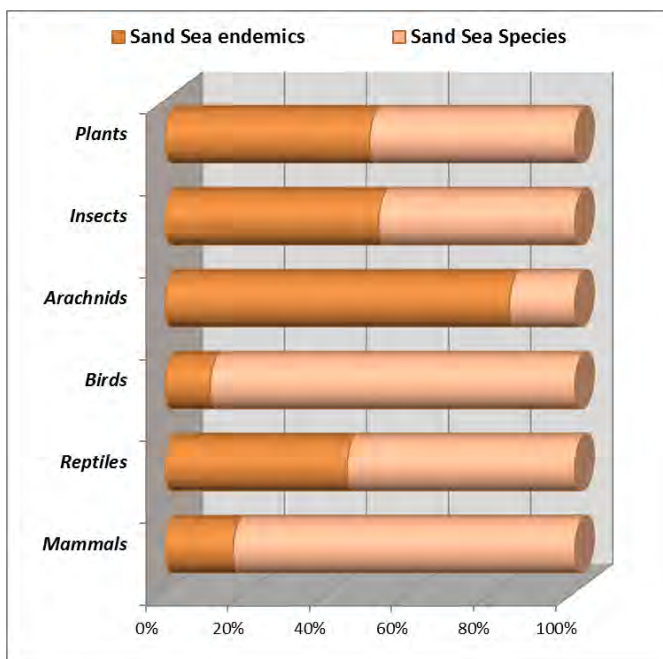


Figure 3.c.2: Endemism and species richness of taxa in the Namib Sand Sea

the Namib Sand Sea is therefore not representative of the entire Namib Desert Biogeographic Province even though the evolutionary responses of its biota have, as can be expected, many convergent similarities with those in other Namib ecosystems.

Criterion x: At the time of nomination, the World Heritage List contained 129 properties with five transboundary properties inscribed under Criterion x. There are 31 properties and one transboundary property inscribed from the Afrotropical Realm (after Udvardy), of which Lake Turkana National Parks, Air and Ténéré Natural Reserves, Banc d'Arguin National Park, Ichkeul National Park and



Socotra Archipelago are in arid or desert settings. The biodiversity values of Banc d'Arguin National Park and Ichkeul National Park are essentially as stopovers and destinations for hundreds of thousands of migrating birds (as is also the case for Saryarka – Steppe and Lakes of Northern Kazakhstan and to a lesser degree Doñana National Park). None of these sites shall be considered further although they may relate to the Sandwich Harbour Ramsar Site that contributes to the overall biodiversity values of the Namib Sand Sea. Additional World Heritage sites that were considered include Ningaloo Coast, Galápagos Islands, Islands and Protected Areas of the Gulf of California, Aldabra Atoll, Grand Canyon National Park and Yellowstone National Park.

Biodiversity includes all organisms, species, and populations; the genetic variation among these; and all their complex assemblages of communities and ecosystems. It also refers to the interrelatedness of genes, species, and ecosystems and their interactions with the environment. Though biodiversity is usually discussed in terms of three levels – genetic, species, and ecosystem diversity – this comparative analysis is based on two aspects alone – *species richness* and *endemicity* (Table 3.c.8). The combination of these two levels is an accepted measure reflecting biodiversity. Additional issues to consider are biogeographic coverage, the number of globally threatened species and economically important species and their wild relatives⁴. These guidelines are deceptively simple as biogeographic coverage is the only information readily available. Species richness may also be forthcoming in some


Table 3.c.8: Endemics and species richness of the sand sea habitat, and the whole Namib Sand Sea property

Group	Endemics	Sand sea habitat	Whole Property
Plants	8	15	265
Arachnids	37	44	138
Insects	108	207	1388
Rest of invertebrates	0	5	54
Reptiles	8	18	71
Birds	1	9	301
Mammals	2	12	75

cases but may give a deceptive view of the Property. For example, 83.5% of the more than 3,077,700 hectares of the Namib Sand Sea consists of the sand dune habitat that is the core of this nomination. The high degree of endemicity in most classes (Figure 3.c.2) is a prominent feature of the biodiversity, even though overall species richness is relatively low (as is also the case for the Galápagos Islands). Endemicity of some Namib Sand Sea invertebrate taxa is as high as for groups in that iconic example of insular evolution.

If the overall species richness of the Namib Sand Sea is considered, species numbers rise dramatically. It highlights that the usefulness of taxonomic checklists, as a measure for rapid assessment and broad definition of important areas for biodiversity conservation, should be augmented by more specific arguments. The overall biodiversity of the Namib Sand Sea is a secondary attribute related to the interdigitation of an array of habitats essential for the wholeness of the geological and aesthetic attributes of the Namib Sand Sea (Criteria vii and viii). They add a layer of ecological diversity that illustrates the interaction between the species complexes of the sand sea habitat with associated desert communities (Criterion ix) that is particularly important for understanding the evolutionary

⁴ Smith and Jakubowska 2000. A global overview of protected areas on the World Heritage List of particular importance for biodiversity. UNEP World Conservation Monitoring Centre.



history of the high degree of endemism. Habitat complexity and the vibrant communities in functional ecosystems that are not related to arid terrestrial systems, e.g. the wetlands of the Sandwich Harbour Ramsar Site, the marine littoral of the Benguela oceanic province, savannah corridors along the ephemeral rivers, and the Succulent Karoo outliers in the south, all contribute to the overall biodiversity values of the Property.

The Namib Desert Biogeographical Province has not been considered particularly outstanding from a global biodiversity perspective in previous thematic studies⁵. Assessments from other prioritisation programmes such as WWF Global 200 Ecoregions, Conservation International's Global Biodiversity Hotspots, Centres of Plant Diversity, Endemic Bird Areas and IUCN's Red List of Threatened Animals recognise the significance of the Namib Desert Biogeographical Province and its species without being concerned about them. It is not an omission or disregard for its species richness and endemism, but a reflection of the security offered to the biota through a long history of conservation success and sustainable environmental exploitation. Annexes 10-17 indicate where possible the distribution status of the biota, of which all near endemics are endemic to the biogeographical province and arid-area specialists are endemic to the much larger southern African arid zone. Despite the restricted ranges of many groups, the long-term protection that ensures habitat security and shields the biota resulted in a low degree of endangered, threatened or vulnerable species.

The state of conservation of the Namib Sand Sea that shelters its biota stands in sharp contrast to the sites such as and Air and Ténéré Natural Reserves that have been on the List of World Heritage in Danger since 1992 with many of the species contributing to its OUV for inscription being extinct in the Property (35COM 7A.11) and the Arabian Oryx Sanctuary, which would have been the most comparable World Heritage site to the Namib Sand Sea. The latter was delisted in 2007 after conservation of the Property has deteriorated to the extent that it has lost its Outstanding Universal Value and integrity (31COM 7B.11). The biological systems of the other comparable site in Africa, Lake Turkana National Parks, that are the basis of its inscription on the List of World Heritage under Criterion x are in imminent danger and may be considered in future as a World Heritage site in Danger [35COM 7B.3 - Lake Turkana National Parks (Kenya) (N 801bis)]. Even though the latter is not through neglect of its obligations by the State Party, it illustrates the present security of the Namib Sand Sea's state of conservation.



Figure 3.c.3: An *Oryx gazella* against a backdrop of Namib Sand Sea dunes (Gobabeb Centre)


⁵ UNEP 2000. A global overview of protected areas on the World Heritage List of particular importance for biodiversity.



The Namib Sand Sea is one of the better studied desert systems world-wide as reflected in the quality of ecological and biodiversity information that is available. Comparison with other areas, whether world heritage or not, requires similar levels of information that are not readily available. Annex 8 in Goudie and Seely 2011 (World Heritage Desert Landscapes. IUCN) reflects some of the knowledge about the biodiversity of desert landscapes that is available. That information was supplemented by additional information gleaned from other thematic or biodiversity studies on well-known biodiversity hotspots that are potentially comparable to the Namib Sand Sea (Table 3.c.6). It was not feasible to do a breakdown of that information to specific ecosystems within those properties to compare to the sand sea habitat, thus the overall species richness of the Namib Sand Sea was used for comparison. It was presumed that the Namib Sand Sea would not compare well. A hyper-arid desert system with only substrate and climatic dispersal barriers may be expected to be less diverse than more productive ecosystems as reflected by plant taxa. However, it compared surprisingly well to other world heritage properties inscribed for their biodiversity values.

Table 3.c.9: Comparison of biodiversity values in the Namib Sand Sea to other desert and World Heritage properties inscribed under Criterion x

Place	Type of Desert	Vascular Plants	Vertebrates	Invertebrates	Endemics	
					Plants	Vertebrates
Arches National Park	Plains desert	2556	489	?	0	0
Bodélé Depression	Plains desert	500	335	?	?	3
Death Valley	Plains desert	2490	498	?	?	3
Lut Desert	Plains desert	900	483	?	?	5
Western Desert and Bagnold Dunes	Plains and sand-dune desert	500	335	?	?	3
Galápagos Islands	Arid interior	543	252	2289	236	93
Aldabra Atoll	Island	185	106	?	17	4
Socotra Archipelago	Island	825	236	800	308	38
Ningaloo Coast	Arid shrubland	630	329	?	18	15
Gulf of California	Arid shrubland	238	295	?	50	23
Réserve de la Biosphère El Pinacate et le Grand désert d'Altar	Arid desert	560	324	?	?	?
Grand Canyon National Park	Arid shrubland	1737	463	?	12	0
Yellowstone National Park		1350	399	?	0	1
Great Gobi Desert	Arid desert	410	214	?	?	?
Repetek Biosphere State Reserve (Karakum Desert)	Arid desert	269	254	1343	?	?
Namib Sand Sea	Hyper-arid desert	265	446	1580	8	11



Attempts to compare the biodiversity values of the Namib Sand Sea with sites on the tentative lists of other State Parties, e.g. the Grand Erg Occidental (Algeria), the San Pedro de Atacama (Chile – for cultural attributes), the Taklimakan Desert — *Populus euphratica* Forests (China), the Great Desert Landscapes (Egypt), the Desert National Park (India) in the Thar Desert, and Khor Al-Adaid Natural Reserve (Qatar) in the Arabian Desert were not feasible as the level of information that could be sourced is inadequate for comparative purposes.

Criteria vii to x – global comparison: The 936 properties on the World Heritage List in November 2011 included 183 natural and 28 mixed properties. Of these, 20 properties with two transboundary properties were inscribed under all four natural criteria. Inscribed sites considered to be of particular significance for comparison to the Namib Sand Sea include the Great Barrier Reef, Galápagos Islands, and Grand Canyon National Park, either because the combination of aesthetics and active geological processes is integral to the ecological and biodiversity values (Great Barrier Reef), or for their arid features (Galápagos Islands, Grand Canyon National Park). Other listed properties such as Volcanoes of Kamchatka, Lake Baikal and Yellowstone National Park were only briefly considered, as the geological values refer to the setting against which backdrop the ecology and biodiversity values are exhibited. The biodiversity values of Shark Bay, Western Australia and Ngorongoro Conservation Area are spectacular, but endemism is low.

The altitudinal ecological succession and associated biodiversity changes that contribute to the very high species richness of the Grand Canyon National Park is the consequence of down-cutting and erosion of the Colorado River. The steep ecological gradient from arid conditions at the bottom of the sun-baked canyon to mountain woodland vegetation on the canyon rim is very different to the Namib Sand Sea.

The extreme isolation of the Galápagos Islands and the steep ecological gradients from the coastal zone through widespread arid zones to the higher elevation humid zones are products of the volcanic origin of the islands. The humidity results from dense fog intruding over land from the adjacent ocean as is also found in the Namib Sand Sea, in both cases having a significant evolutionary effect. In the Galápagos the fog condenses on the rocky outcrops to sustain life, whereas in the Namib the sand absorbs condensation that requires exceptional adaptations in plants and animals for direct harvesting of condensed fog moisture through condensation. These are different aspects of the adaptability and resilience of life. The geologic processes at the Galápagos Islands do not have a direct effect on their ecological processes and exceptional biodiversity, which is the case in the Namib Sand Sea where geological factors are central to its biota's evolutionary history. The interaction and close relationship between the values of all four natural criteria for World Heritage is therefore unlike any other property currently inscribed.

Criteria vii to x – national comparison: Paragraph 132 of the Operational Guidelines expects a '*comparative analysis of the property in relation to similar properties*' on a national as well as on an international basis. In Namibia, there are three other dune deserts apart from the Namib Sand Sea. Two are closely related to the Namib Sand Sea, although extending along the coast beyond the borders of Namibia south into South Africa and north into Angola. The third is part of an interior continental 'thirst land', the Kalahari, lying in the centre of southern Africa with only its western portion in Namibia.



The sand dunes of the Namib Desert are usually described as the southern, central and northern dune fields. The dune sea of the Namib Desert begins at the Olifants River mouth, south of the Orange River in South Africa. The Olifants River represented the outflow of the proto-Orange River before it was captured by its current lower course. Sparse sand from the Olifants River is distributed along the coast and blown inland by the southern African anti-cyclonic system. Extensive accumulations of sand but no high dunes are found south of the Orange River. Sand blowing from the south that reaches the Orange River is carried to the sea along with that coming from further inland.

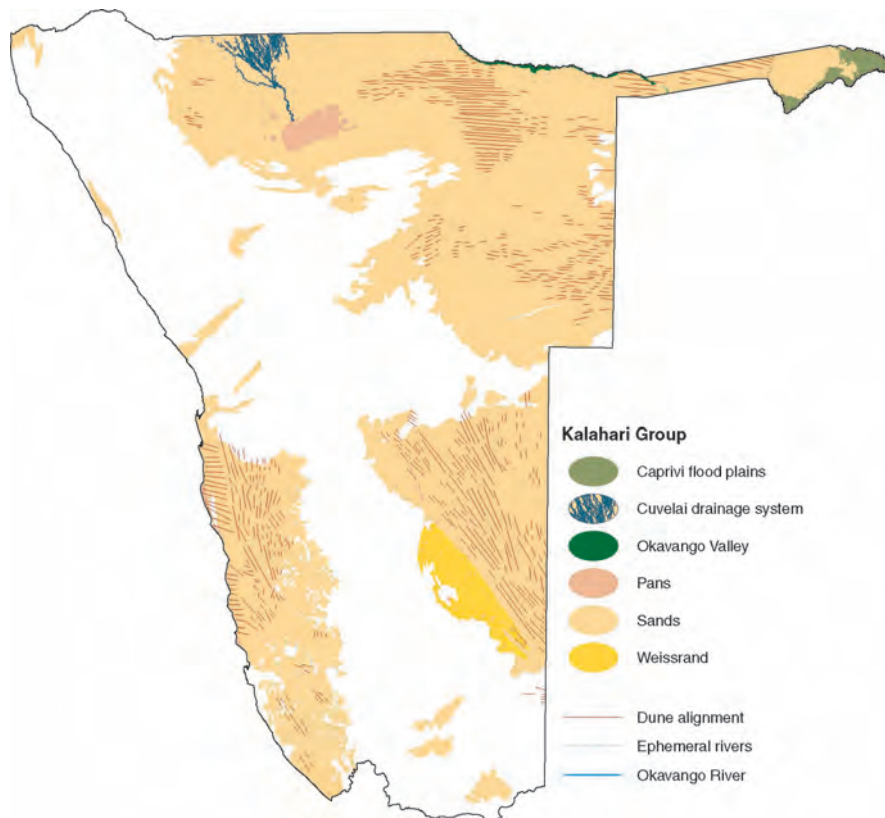


Figure 3.c.4: Sandy substrates in Namibia: three related but distinct sand dune fields lie along the Atlantic coast in the Namib desert while the sandy substrate of the Kalahari basin covers a large portion of central southern Africa (from Mendelsohn et al. 2002)

At the same time, some of the sand being transported down the Orange River is blown northward off the north bank of the river. This, together with sand blown on-shore from the coast north of the Orange River, forms extensive pale-coloured mobile sand sheets, sand plains and coastal dune hummocks throughout the Sperrgebiet National Park. A few stand-alone, red semi-stabilised dunes occur further inland such as the Obib dunes nestled between the Obibberg and the Schakalsberg immediately north of the Orange River. Other independent dunes associated with mountainous terrain include the Chamnaub and Tsaus dune grasslands. The sand accumulations including some genuine dunes, extending from the Olifants River to the Aus – Lüderitz railway on the southern border of the Namib-Naukluft Park, constitute the southern ‘dune fields’.

The central dune fields encompass the contiguous Namib Sand Sea as well as a part of the Namib-Naukluft Park extending south of the sand sea and excluded from the proposed heritage nomination, and a narrow ridge of coastal dunes extending northward from the Kuiseb River to the Swakop River. Although not part of the Namib Sand Sea being proposed for World Heritage status, this narrow coastal dune belt incredibly harbours one totally endemic tenebrionid beetle restricted to its 30 km x



5 km extent. These dunes are formed of sand from the Namib Sand Sea that is washed down from the upper Kuiseb River and deposited in its lower reaches. From there the sand crosses the poorly delineated lower Kuiseb River braided courses. This narrow dune field, including all the sand from the Namib Sand Sea, is terminated by the well incised lower Swakop River to the north. From there the sand is washed out to sea and transported northwards by current and waves for over 230 km, with only small amounts of sand being deposited along the shore south of the Huab River mouth.

The northern dune field starts at approximately the Huab River mouth from where pale, almost white sand is blown inland and northward. The northern dune field consists of a series of triangular-shaped dunes with their apex at the mouth of a river from where sand is blown inland and northward until it reaches the next river and is carried once more toward the coast. These dunes intermittently occupy the Skeleton Coast Park. Such dunes form north of the Huab, Koigab, Unjab, Hoanib and Hoarusib rivers in Namibia, and north of the Kunene and Coroca Rivers in Angola. This dynamic zig-zag transport of sand, originating in the eastern highlands of southern Africa and starting at the Olifants River, terminates at the Caranjamba River in Angola.

The fourth sand dune habitat comprises the western edge of the Kalahari Basin. It consists mainly of linear, vegetated sand dunes relatively well stabilised by grassland vegetation and separated by wide interdune valleys. In Namibia this landscape is used for grazing of wildlife and livestock throughout much of the >1,000 km long eastern border of the country. The thick Kalahari sand mass extends from South Africa northwards to the Congo River and occupies parts of South Africa, Botswana, Namibia, Angola, Zimbabwe, Zambia and the Democratic Republic of the Congo.

Criterion vii: All four dune fields in Namibia have unusual natural phenomena and areas of exceptional natural beauty and aesthetic importance. All four have been featured in natural history books, travel books, on film and in paintings and photographs. Table 3.c.10 briefly compares some of the characteristics of these dune fields.

Table 3.c.10: Comparison of natural phenomena and beauty

Characteristic	Southern dune field	Central dune field (Namib Sand Sea)	Northern dune field	Kalahari
Natural desert vistas	Spectacular	Spectacular	Spectacular	Modified by vegetation
Pristine environment	Extensive active diamond and zinc mining	Pristine	Varied active mining	Livestock farming and some crops
Large, active dunes	Active sand sheets, barchans and dunes to 30 m high	Gigantic active dunes to 300 m high	Active sand dunes <100 m high	Active dune crests <20 m high
Continuity of sand sea	Sand sheets connecting individual dune forms	Continuous sand sea	Partially or completely unattached dunes	Continuous sand-filled basin
Mobility of sand sea	Extremely mobile	Continuously mobile	Extremely mobile	Semi-stabilised by grassland



Accessible dunes	Controlled entry requiring 4x4 vehicles	Sossus Vlei controlled, accessible to sedan cars	Controlled entry for fishing access	Accessible along tarred roads and on commercial farms
Extraordinary flora	Myriad of diverse succulents on sand sheets; sparse dune vegetation	Sparse dune vegetation	Sparse dune vegetation	Extensive vegetation cover, primarily grasslands
Extraordinary fauna	Few vertebrates and numerous invertebrates	Few vertebrates and numerous invertebrates	Few vertebrates and numerous invertebrates	Few vertebrates and numerous invertebrates
Primary moisture sources	Fog and some winter rain (<100 mm)	Fog and some rain (<100 mm)	Fog and some summer rain (<100 mm)	Summer rain (<100 mm in south to >500 mm in north)
Evaporation	<1,680 mm to 2,100 mm/year	<1,680 mm to 2,100 mm/year	<1,680 mm to 2,100 mm/year	1,800 mm to >2,660 mm per year
Winds	South-westerly winds predominate	South-westerly winds predominate	South-westerly winds predominate	Variable winds primarily easterly
Associated landscapes	Ocean, rivers, escarpment, inselbergs, pans	Ocean, dry rivers, escarpment, inselbergs, pans	Ocean, rivers, escarpment, inselbergs, pans	Mainly flat Kalahari basin dunescape

Criterion viii: Examples of major stages of earth’s history, on-going geological processes and significant geomorphic and physiographic features are found in all four dune areas. The three coastal dunes are derived from the same three integrated, contrasting ‘conveyor belt systems’ consisting of fluvial transport, coastal long-shore drift and coastal on-shore winds. All three were underlain by a semi-consolidated dune system, known as Tsondeb Sandstone, dating to 21 million years which originated from the same three-step conveyor belt system. This palaeo sand sea has been stripped from the northern dune area, is partly remaining in the south and underlies the entire central dune area.

All four dune areas are basically aeolian landscapes interacting with differing amounts of sand underlain by differing basal topography manipulated by different wind strengths and directions. A full range of dune types can be found along the Namib coast while this diversity is absent from the Kalahari. The three coastal dune fields continually evolve *in situ* through the interplay of fluvial sand transport by ephemeral and perennial rivers with long-shore drift and with coastal, on-shore winds dominated by the southern Atlantic anti-cyclonic system. In contrast, the Kalahari is dominated by the continental anti-cyclonic system that has been identified as the most stable high pressure system on earth, sometimes remaining steady for more than a month at a time.



Table 3.c.11: Comparison of examples of major stages of earth’s history and significant ongoing geological processes

Characteristic	Southern dune field	Central dune field (Namib Sand Sea)	Northern dune field	Kalahari
Palaeo-dunes underlying active dunes	Palaeo-dunes primarily toward coast	Palaeo-dunes underlie entire Namib Sand Sea	Palaeo-dunes have been eroded away	Palaeo-dunes/ lunettes border dry pans
Sand source	Three step conveyor system originating in eastern, southern Africa	Three step conveyor system originating in eastern, southern Africa	Three step conveyor system originating in eastern, southern Africa	Deposits from rivers terminating in the basin and from <i>in situ</i> erosion
Striking sand colours	Pale to red sand	Vast range	Primarily white to light yellow sand	Dark red
Transverse rivers	Perennial Orange River; ephemeral rivers ending in pans; large dry valleys with small water courses; river and dune sediments interwoven	Several ephemeral rivers, some blocked by dunes; deeply incised water courses in larger dry valleys; river and dune sediments interwoven	Several ephemeral rivers and perennial Kunene River cross dune field; deeply incised water courses in larger dry valleys (some of glacial origin); river and dune sediments interwoven	Ephemeral rivers in larger dry valleys parallel to interdunes, not transverse – increasingly clogged by alien woody vegetation
Inter-digitating plains	Extensive rocky plains underlie sand sheets	Bordering rocky, inter-digitating plains	Bordering and underlying rocky, inter-digitating plains	Sandy plains
Outcrops and escarpment	Below western escarpment; Roterkamm meteor crater; rocky ranges and inselbergs	Below western escarpment; bordering rocky ranges and inselbergs	Below western escarpment; bordering rocky ranges and inselbergs	Little relief; occasional inselberg
Angle of coast	South-south east to north-north west	Primarily south to north	South-south east to north-north west	NA
On-shore winds	Strongest recorded on earth	Moderately strong	Very strong	NA
Dune forms	Primarily vegetation hummocks, dune trains, sand sheets and small dunes all moving northwards;	Myriad contiguous dune types – from vegetation hummocks and barchans on the coast to linear	Primarily independent barchan and transverse dunes with vegetation hummocks on coast; to	Linear dunes; less than 50 m high



	barchans up to 30 m high racing northwards at 50–300 m per year	and star dunes inland; to approximately 300 m high	approximately 100 m high	
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Criterion ix: Ecological and biological processes contributing to evolution and development of terrestrial ecosystems and communities are on going in all four dune areas. Many, diverse well-adapted dune animals, a large number of them endemic to their dune field or at least the broader Namib area, interact through intricate food webs and are adapted to extremely harsh desert conditions. Exceptional physiological and behavioural adaptations are the rule and range from bizarre mechanisms for uptake of fog-water as a primary water source, for plants and animals, to cooling by running rapidly across the sand surface or diving to cooler sand layers beneath the surface. Constantly changing structures, shapes and succession of dunes and of the plant and animal communities that live in them ensure continually evolving responses and specialisations. These on-going ecological and biological processes have been studied, described and elucidated by scholars and scientists from around the world.

Table 3.c.12: Comparison of on going ecological and biological processes and evolution and development of communities

Characteristic	Southern dune field	Central dune field (Namib Sand Sea)	Northern dune field	Kalahari
Uptake of moisture	Plant and animal adaptations to use fog-water; germination requires rain	Plant and animal adaptations to use fog-water; germination requires rain	Plant and animal adaptations to use fog-water; germination requires rain	Rain is primary source of water
Oxygenated sand as subsurface retreat	Animals can dive into or swim through fluid sand	Animals can dive into or swim through fluid sand	Animals can dive into or swim through fluid sand	Burrowing most common in sand habitat
Mobile barchan dunes promoting evolution and speciation of fauna	Very mobile barchan dunes throughout	Mobile barchan dunes particularly along coast	Mobile barchan dunes	Barchan dunes absent
Ever shifting dunes promoting evolution of mechanisms in biota for adaptation, escape or avoidance	Few dune forms constantly hammered by strong winds	Myriad of dune forms across the broad Namib Sand Sea from coast to 120 km inland	Variety of dune forms constantly changing shape across 40 km expanse	Linear dunes relatively stable
Examples of flagship species	Namaqua dune molerat; desert rain frog; Nama	Namib golden mole; sidewinder adder; shovel-	Desert plated lizard; Namaqua chameleon (also	Mainly wide-spread sand-dwelling



	padloper; dwarf mountain adder; southern rock agama; African penguin; Barlow's lark; <i>Trigonephrus</i> snail; myriad endemic succulents	snouted lizard; Brain's blind legless skink; web-footed gecko; Koch's barking gecko dune lark; myriad endemic tenebrionid beetles and arachnids	south & central); white tenebrionid beetles, other tenebrionids and arachnids	species – invertebrates to elephants
Plant productivity	Rich succulent flora, primarily on rocky sand sheets	Sparse dune vegetation, varies with rainfall	Very sparse vegetation	Stabilising grass, tree and shrub cover with relatively high productivity
Important plant species in area (Atlas 2002 ⁶)	Quiver tree; !nara	!nara, <i>Trianthema hereroensis</i>	Welwitschia; mopane; !nara	Quiver tree; kiaat; devil's claw
Bush encroachment (Atlas 2002)	NA	NA	NA	<i>Acacia mellifera</i> ; <i>Terminalia sericea</i>

Criterion x: *In-situ* conservation of biological diversity over large areas is possible in all four dune habitats in Namibia, although they are currently under very different management systems. MET has various levels of responsibility in each of the four areas, although this responsibility is broadly shared in three of them.

The four dune fields have been studied to different degrees and with different foci so exact comparisons between them is not possible. Endemicity of the fauna and flora is high in the southern and central coastal dune fields and essentially absent in the Kalahari Basin encompassed within Namibia. Although there are spectacular endemic species in the northern dune Namib, their relative proportion with respect to the entire biota is not known. The study of the fauna and flora of all four dune fields has contributed outstanding universal value to science and our understanding of conservation, evolution, and physiological and behavioural adaptations of several exceptional desert biotas.

⁶ Mendelsohn, J. Jarvis, A. Roberts, C. and Robertson, T. 2002. Atlas of Namibia. David Philip, Cape Town: 200 pp.



Table 3.c.13: Comparison of natural habitats for *in-situ* conservation of biological diversity

Characteristic	Southern dune field	Central dune field (Namib Sand Sea)	Northern dune field	Kalahari
Size or area (823,988 km ² total Namibia)	Sperrgebiet: 21,600 km ² encompassing assorted, intermixed mountains, rocky surfaces, sand sheets and scant dunes	30,777 km ² encompassing primarily contiguous dunes (84%), gravel plains (8%), coastal flats (4%), hills (4%)	Est: 16,000 km ² Skeleton Coast Park encompassing intermittent gravel plains and dunes	Est: 40% of Namibia in Kalahari Basin with sandy substrate
Designated protection	Sperrgebiet National Park previously restricted as Diamond Area #1	Namib-Naukluft Park previously restricted as Diamond Area #2	Skeleton Coast Park open for prospecting and mining	Private property; Tsumkwe conservancy; Khaudum Game Park; Caprivi protected areas
Management authorities	MET; NamDeb (diamonds) and other mines	MET	MET and other bodies	Private sector; also conservancy and MET
Research status	Rich vegetation relatively well collected	Extensive literature on variety of topics	Studies of specific species and areas published	Studies of specific species and areas published
Monitoring	Plan compiled and initiated	Long-term, selected fauna and flora	Short-term lichen monitoring; large mammals ongoing	Intermittent monitoring of birds and large mammals
Current development	Diamond and zinc mining; controlled, guided tourism; tourist accommodation in nearby towns; Oranjemund town	Controlled, guided tourism; limited self-drive tourism; lodges border area	Mining and prospecting; restricted tourism; access to fishing areas only; lodges within area; two MET stations in park	Commercial and communal farming and conservancies; hunting farms; national parks; lodges; towns
Biomes (from Atlas 2002)	Succulent Karoo; Desert; Nama Karoo	Desert; Nama Karoo	Desert	Nama Karoo; Acacia Tree-and-shrub Savanna; Broadleaved Tree-and-shrub Savanna (S to N)
Biodiversity recognition	Designated floral 'hotspot'; Orange River mouth Ramsar Site	Potential hotspot designation; Sandwich Harbour Ramsar Site	Kunene River mouth potential Ramsar Site	Several ephemeral pans; diverse wildlife in parks
Endemics [Note: available	Entire Sperrgebiet Est minimum:	Namib Sand Sea Minimum known:	Northern dunes Est. at least (on	Unknown



information not directly comparable]	Plants 45 Reptiles 5 Arachnids 26 Insects - many with restricted ranges	Plants 8 Arachnids 37 Insects 108 Reptiles 8 Birds 1 Mammals 2	dunes): Insects 5 Reptiles 1	
Plant species richness; almost 4,000 species in Namibia (from Atlas 2002)	Up to 400 species (Atlas 2002) (680 + 90 lichens Pallett 1995 ⁷)	Up to 100 species (Atlas 2002) (265 Namib Sand Sea, this dossier)	Up to 100 species (Atlas 2002)	Up to 500 species (high in north) (Atlas 2002)
Bird species richness; 658 species recorded in Namibia (from Atlas 2002)	Up to 80 species (Atlas 2002) (110 Pallett 1995)	Up to 140 species (Atlas 2002) (301 Namib Sand Sea, this dossier)	Up to 140 species (Atlas 2002)	More than 230 species (high in north) (Atlas 2002)
Reptile species richness; 246 species recorded in Namibia (from Atlas 2002)	Up to 60 species (Atlas 2002) (100 Pallett 1995) [+ 16 species frog]	Up to 40 species (Atlas 2002) (71 Namib Sand Sea, this dossier)	Up to 50 species (Atlas 2002)	Up to 70 species (high in north) (Atlas 2002)
Mammal species richness; 217 species recorded in Namibia (from Atlas 2002)	Up to 60 species (Atlas 2002) (76 Pallett 1995)	Up to 60 species (Atlas 2002) (75 Namib Sand Sea, this dossier)	Up to 45 species (Atlas 2002)	Up to 105 species (high in north) (Atlas 2002)
Scorpion species richness; 56 species known in Namibia (from Atlas 2002)	Up to 17 species (Atlas 2002)	Up to 13 species (Atlas 2002) (20 Namib Sand Sea, this dossier)	Up to 17 species (Atlas 2002)	Mainly 6–9 species along eastern border (Atlas 2002)

The geologic evolution and ongoing processes of the four dune areas in Namibia have a direct effect on their ecological evolution, processes and exceptional biodiversity. These processes are central to the evolutionary history of the three coastal dune fields although less so in the Kalahari. The three additional dune fields situated in Namibia and neighbouring countries have identified, circumscribed superlative features when compared with the Namib Sand Sea. That is, in some instances individual features are even more remarkable in the three comparative sand seas than in the Namib Sand Sea, but taken as a whole, the Namib Sand Sea is comprised of a superlative composite suite of attributes. A key issue in terms of nomination of a World Heritage site, however, is the potential for management focused on *in-situ* conservation of biological diversity and in this regard the Namib Sand Sea is without comparison. The interactions and close relationships in the Namib Sand Sea, among the outstanding universal values of all four natural criteria for World Heritage, are therefore unlike any other similar property within Namibia.

⁷ Pallett J. (ed) 1995. The Sperrgebiet – Namibia’s least known wilderness. Desert Research Foundation of Namibia and NAMDEB Diamond Corporation (Pty) Ltd: 84 pp.



3.d INTEGRITY

The boundaries of the envisaged World Heritage Site Property were designed to encompass all the elements of the Namib Sand Sea that exemplify its Outstanding Universal Values. These elements are well conserved and intact and included on a scale appropriate to the ongoing dynamic processes. Its size of 30,777 km² adequately ensures that all the active dune formations including the underlying fossilised dune formations of the underlying sand sea, causative processes and ancillary habitats related to the fossil and active dune formations are included. The features, processes, relationships and dynamic functions which convey the significance of the Namib Sand Sea, past and present, are fully represented, well conserved and in an excellent, undamaged state. Because of its vast size, difficulty of access and current management by the Ministry of Environment and Tourism, the Namib Sand Sea has not suffered and is not suffering any adverse effects of neglect, use or development.

In terms of the key words related to a World Heritage Site the following conditions exist:

Wholeness: all the necessary attributes essential to address the four criteria are encompassed well within the identified Property.

Intactness: all the necessary attributes are intact. Because of its long history, first of inaccessibility, second of exclusion as part of Diamond Areas #1 and #2 and lastly under the protection of the Ministry of Environment and Tourism within the boundaries of the Namib-Naukluft Park, the identified area is essentially undisturbed.

Absence of threats: none of the attributes are threatened by development or neglect. Tourism is the primary development process envisaged for the Namib Sand Sea and this is well regulated and controlled by the Ministry of Environment and Tourism. Neglect, on the other hand, has been a benefit to the identified Property, as it has ensured that potential disturbance by unwarranted intrusion was not experienced.

Apart from controlled access roads and routes, ablution facilities at visitor sites, and long abandoned huts from early twentieth century mining villages near the coast, there is no other infrastructure within the envisaged boundaries of the World Heritage Site. The magnificent dune-scapes are unspoilt and the incredible scenery is maintained by natural forces. The site includes all the elements typical of extreme desert landscapes, including extensive dune systems; inselbergs and pediplains; gramadullas; deeply incised as well as shallow drainage systems, often terminating in ephemeral pans; and all the biotic zones, dune habitats, and communities of dune life forms. Visitor and management infrastructure within these boundaries is restricted to ephemeral, temporary point locations that have no effect on the well-known and well-researched geological, geomorphological, ecological, and biological processes of the Namib Erg. The very large size of the Namib Erg within the envisaged boundaries, which is in turn wholly within the proclaimed Namib-Naukluft Park, ensures that such geological, geomorphological, ecological, and biological processes shall not be influenced by future human development and economic activities. Likewise, the large size of the envisaged site, and well-established management protocols, will safeguard that the long-term stability and conservation of the highly endemic biotic communities are ensured.

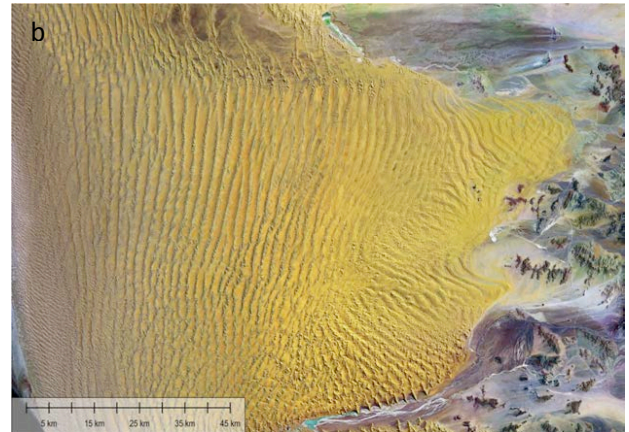
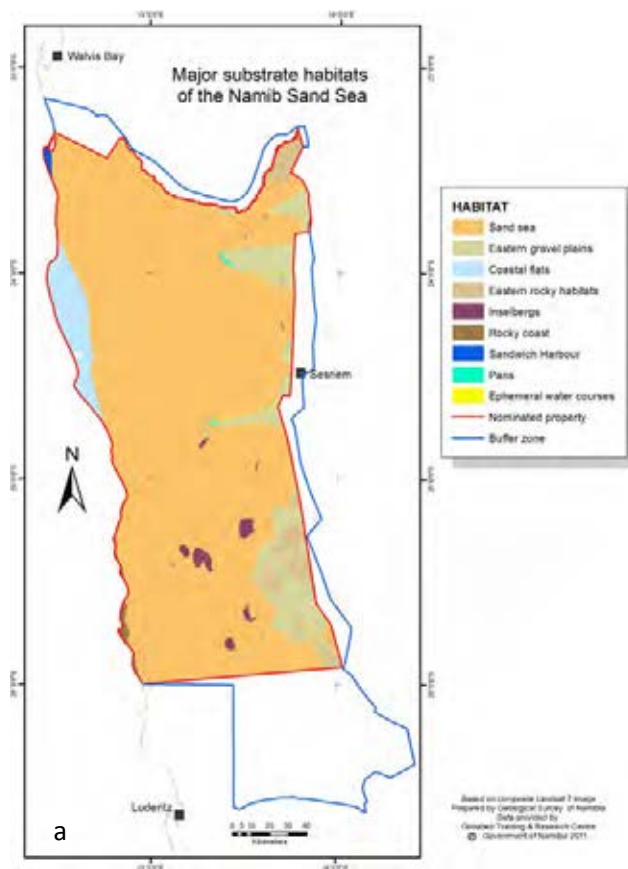


Figure 3.d.1: The vast size, the century of exclusion and then protection and the current controlled adventure tourism have resulted in a state of wholeness, intactness and absence of threat to the Namib Sand Sea (b: Bowen/NASA, c: Schneider)





State of Conservation



**Endemic Damara terns and other birds at the Sandwich Harbour Ramsar Site in the Namib Sand Sea
(Paul van Schalkwyk)**

4

State of Conservation and Factors Affecting the Property

4.a PRESENT STATE OF CONSERVATION

The Namib Sand Sea is managed as a conservation area by the Namibian Ministry of Environment and Tourism as part of the Namib-Naukluft Park. The current state of conservation varies, however, throughout the variety of habitats within the nominated area as a number of past and current uses and proactive measures influence the habitats to different degrees. Although the sand dunes themselves constitute more than 83% of the identified Property, a brief overview of the state of conservation of all the habitats, primarily defined by substrate and geomorphology, follows. All of the habitats are relatively well conserved despite their variable sensitivity (Table 4.a.1).

Table 4.a.1 Present state of habitat conservation within the Namib Sand Sea.

Habitat (% of area)	Sensitivity*	State of Conservation
Sand sea (84% of property)	3	Dunes resilient, sandy plains more easily scarred; tourism traffic mainly confined to dunes; supports diverse endemic fauna and flora; well conserved.
Inselbergs (surrounded by sand sea) (1%)	4	Archaeological resources and vegetation are very sensitive, surrounding pediplains are easily scarred; attractions for dune excursions; relatively well conserved.
Coastal lagoon (Sandwich Harbour) (<1%)	3	Special protected status (Ramsar Site) in park, extremely dynamic habitat, tourism day visits only; semi-annual count of waterfowl; well conserved.
Rocky shore (<1%)	4	Archaeological and vegetation resources vulnerable, relatively inaccessible; well conserved.
Coastal pans/ flats (4%)	5	Extensively disturbed by past diamond mining and prospecting for various minerals; focal area for uranium prospecting; now destination for historic and adventure tourism; easily scarred; relatively well conserved to date due to the long period of natural rehabilitation.
Eastern rocky hills and gramadullas (3%)	3	Archaeological resources and vegetation very sensitive; extensive past use associated with prospecting and livestock farming on gravel plains; limited destination for dune excursions; relatively well conserved.
Endorheaic pans (<1%)	5	Archaeological resources around edges, key megafauna and megafloal habitat; Sossus Vlei is key tourist attraction with high tourism and development pressure; Tsondab Vlei is Strict Nature Reserve but in demand for tourism; other



		smaller pans in east well conserved; all relatively well conserved .
Ephemeral river courses (<1%)	4	Key migration route for non-endemic fauna and flora and breeding habitat; serve as traffic corridors; occasional floods restore habitat; river banks more sensitive than watercourse; relatively well conserved .
Gravel plains (8%)	4	Easily scarred; traffic now confined to designated tracks; scars associated with previous use for prospecting and emergency grazing are disappearing; relatively well conserved .

*The sensitivity of the various elements of the habitat is designated from 1 (very robust) to 5 (very easily damaged).

The fauna and flora living in the various habitats outlined in the table are all well conserved. Since it is an arid area, their populations are very variable depending mainly on rainfall. The only exceptions to this state of conservation are the breeding vultures, particularly *Torgos tracheliotus*. Because of low-flying light aircraft, the breeding pairs along the Tsondab and Tsauchab rivers declined over the past decade although this trend is currently being reversed. Nevertheless, the flight levels of aircraft could be better controlled with appropriate zonation and enforcement of existing regulations. Breeding performance of vultures and other birds of prey could be easily, if slowly, improved if stronger action is taken to regulate tourism flights over the area.

A number of government agencies are responsible, to a greater or lesser extent, for the management of resources in the Namib Sand Sea (Table 4.a.2)




Figure 4.a.1: The pristine state of the environment has been maintained by a long history of neglect, conservation and well-managed tourism treading lightly on the landscape (van Schalkwyk)

Table 4.a.2: Official agencies responsible for resources or management aspects outside the remit of the Namib-Naukluft Park management staff

Authority	Area of influence	Criteria			
		vii	viii	ix	x
Ministry of Agriculture, Water and Forestry (MAWF), Department of Agriculture	Livestock density enforcement & agronomic licencing	X	X	X	X
MAWF, Department of Agriculture	Pesticide licencing & migrant pest control (locusts)			X	X
MAWF, Department of Water Affairs and Forestry	Water extraction licencing & pipeline construction	X			X
Ministry of Defence (MoD)	Marine patrols and off-shore law enforcement	X	X		
Ministry of Environment and Tourism (MET), Department of Environmental Affairs	Evaluating and approving environmental assessment and environmental management plans	X		X	X
MET, Department of Tourism	Tourism planning, licencing & infrastructure maintenance	X		X	X
MET, Department of Tourism	Promotion & awareness	X	X	X	X
Ministry of Finance (MoF)	Fiscal planning and economic prioritisation	X		X	X
Ministry of Fisheries and Marine Resources (MFMR)	Commercial & recreational fishing licences	X		X	X
Ministry of Mines and Energy (MME)	Exploration & mining Licences	X	X	X	X
MME	Power line construction	X			X
MME	Petroleum exploration and transport	X	X	X	X
Ministry of Regional and Local and Housing and Rural Development (MRLGHRD)	Town & industrial development				
MRLGHRD	Coordination with Regional Government & Traditional Authorities	X		X	X
Ministry of Trade and Industry (MTI)	Industrial development planning & licencing	X		X	X
Ministry of Works and Transport (MWT), Department Transport	Civil Aviation licencing & operational enforcement			X	
MWT, Roads Construction Company	Road maintenance & construction	X		X	X
MWT	Ship licencing & operational enforcement	X	X		
National Planning Commission (NPC)	Development planning coordination	X		X	X
Regional Governments (Erongo, Hardap, Karas)	Regional development planning & infrastructure needs assessments	X		X	X
Town Councils (Lüderitz, Walvis Bay)	Local development planning	X		X	

A range of other official agencies also has responsibilities and authority for managing particular resources occurring in the area. Currently interaction and communication between the different agencies is poor resulting in poor control and law enforcement over sensitive resources, e.g.



archaeological resources are legally protected but, in practice, widely overlooked. A number of other stakeholders are involved in conserving the Namib Sand Sea and have been consulted in the process of preparing this dossier (Annex 24).

The one exception to adequate protection is the frequent light aircraft flights undertaken by tourism operators. While these do not land any place except their departure and arrival airports and approved landing strips, they sometimes fly below the required 1,000 m limit. A small aircraft tourism industry at Sesriem on the eastern edge of the Property mainly flies to the coast and along ephemeral river courses, while operators from Swakopmund enter and exit all along the northern boundary.

Balloon excursions are popular over the spectacular dunes. Operators skirt the eastern edge, taking off and landing outside the boundaries but still provide expansive views over the Sand Sea. Balloon excursions are strongly controlled by the weather, especially wind, and take place within the first several hours of the morning immediately after first light.

Several concessions have been granted for adventure tourists, primarily using off-road vehicles, to enter into remote areas of the Namib Sand Sea through specific entry and exit points. In addition to the experience of driving through the spectacular dunes, favourite destinations for these excursions are the remote inselbergs and coastal areas with their history of diamond mining within the Property. Although access is well regulated, it is of some concern that the sensitivity of resources such as archaeological, historical and vegetation concentrations may be overlooked by the operators and visitors. These issues have been identified and measures are being put in place to sensitise operators and visitors. In addition there is a need to develop monitoring mechanisms to evaluate the effect of off-road traffic along traffic corridors granted to concession holders. Each concession holder is granted a different corridor to minimise impact.

With the recent 'uranium rush' in the central Namib north of the identified Property, augmented by interest in other strategic minerals, such as the diamond placer occurrences, speculative Exclusive Prospecting Licences (EPLs) have been granted all around the borders of the Property and along portions of the coast by the Ministry of Mines and Energy (MME). These speculative EPLs currently exist on paper only, as no prospecting within the designated Property has taken place over the past four years. Currently, 17 EPLs are under consideration with four of them granted and 13 pending. All those that have been granted will expire within two years. Moreover, even with a prospecting licence, companies still require an official entry permit that is subject to environmental management procedures from the MET. The Minister of Mines and Energy has stated that these EPLs will be withdrawn by MME when the current EPLs expire, and no further EPLs will be granted. This firm approach to prospecting in the nominated area has to be approved by Cabinet.


Conservation of the area to ensure preservation of the Outstanding Universal Values of the Namib Sand Sea is considered as the area is developed. A number of tourism concessions have been granted by MET within the Property (Table 4.a.3). These are preceded by an EIA, taking into account the values of the Property, undertaken by independent consultants and approved by MET. These concessions are presently exclusively for adventure tourism involving four-wheel drive experiences during which the tourists use fly-camps, prepared by the concessionaire, designed to leave no trace

of their single-night use. To date, the concessionaires jointly oversee their own compliance with regulations of MET and no major violation has been reported.

The majority of these tourism concessions extend along the coastal reaches of the Namib Sand Sea, operating from Lüderitz to Walvis Bay. Permit conditions under which the five existing concessions operate allow for up to approximately 6,000 tourists per year, each spending five nights camping in the dunes. There are also a number of tourism concessions along the northern border that have mainly been granted to indigenous people living outside the Namib Sand Sea in the Kuiseb River valley. Other indigenous groups are also demanding and being awarded access based on purported historical territorial claims in the area. They usually hire professional tourism organisations to run the operations. This emergent community involvement and benefit sharing from the Namib Sand Sea is likely to expand as mechanisms for managing such issues mature.

Table 4.a.3 Active tourism concessions granted in the Namib Sand Sea

Name of concession	Entry and exit points/route	Number of trips per month allowed	Conditions of use
Namab – using camp at Meob Bay	Kanaan, Elim or Rooibank; exit Sandwich Harbour	2 trips/mo with 12 tourist vehicles & 2 guide vehicles; 6-10 days at Meob	Permit from MET; designated routes
Uri Adventures (with Topnaars)	Lüderitz to Walvis Bay	2 trips/mo with 12 tourist vehicles & 2 guide vehicles	Permit from MET; designated route
Uri Adventures (with Topnaars)	Saagberg to Conception Bay to Walvis Bay	2 trips/mo with 12 tourist vehicles & 2 guide vehicles	Permit from MET; designated route
Uri Adventures (with Topnaars)	Rooibank to Conception to Walvis Bay	2 trips/mo with 12 tourist vehicles & 2 guide vehicles	Permit from MET; designated route
Coastway Tours	Lüderitz to Walvis Bay via Saddle Hill	2 trips/mo with 12 tourist vehicles & 2 guide vehicles	Permit from MET; designated route
Omalwendu	Lüderitz to Walvis Bay	2 trips/mo with 12 tourist vehicles & 2 guide vehicles	Permit from MET; designated route
Belvedere	Lüderitz to Walvis Bay	2 trips/mo with 12 tourist vehicles & 2 guide vehicles	Permit from MET; designated route
Gobabeb	Northern dunes between Kuiseb River and Tsondab Flats	2 trips/mo with 12 tourist vehicles & 2 guide vehicles (not activated)	Permit from MET; designated route
Pending			
Off-road Tours and Safaris	Springbok Vlake Uri-Hauchab to Kuiseb	2 trips/mo with 12 tourist vehicles & 2 guide vehicles	Permit from MET; designated route
Wild at Heart	NE corner of dune field	2 trips/mo with 12 tourist vehicles & 2 guide vehicles	Permit from MET; designated route




Currently, one community-initiated Lodge Concession is under consideration at Meob Bay on the coast within the Namib Sand Sea, pending an Environmental and Social Impact Assessment (ESIA) and approval of an Environmental Management Plan (EMP). The tourists would traverse the width of the Sand Sea from the south-eastern border of the identified Property to Meob Bay. Another proposal, designed to support job creation, targets development at Tsondab Vlei, but has yet to be approved due to the sensitivity of the area and its zonation as a strict nature reserve.

A platform where tourism concession holders can interact with the MET and each other has been recently established. The Namib Concession Holder Forum, attended by the heads of all the concession holding companies operating in the Namib Sand Sea, meets under the chair of the Under Secretary of the MET. Topics for discussion include the need for the concessionaires to police themselves and their clients. MET intends to introduce the concept of developing a dune travel training programme which will be discussed at this forum.

Conservation depends on having information about the area to be conserved. The major part of research undertaken in the Namib Sand Sea consists of fifty years of research conducted by the Gobabeb Training and Research Centre. The Centre is located on the northern banks of the Kuiseb River adjacent to the proposed Property boundary. The largest part of their research has focused on the northern part of the Namib Sand Sea although research excursions have covered most of the proposed area. Research subject areas include, *inter alia*, archaeology, climatology, ecology, geography, geology, geomorphology, animal and plant physiology and behaviour. Many publications covering these fields are included in the extensive bibliography attached (Annex 21).



Figure 4.a.2: Sandwich Harbour with its myriad endemic Damara terns and other seabirds is a haven for migratory species, while at the same time a popular destination for adventure tourists and nature lovers (van Schalkwyk)



The MET has undertaken ornithological research at Sandwich Harbour and censuses of large mammals on the eastern edge of the identified Property. A variety of other persons and institutions have made short-term studies of select areas and topics in the Namib Sand Sea. They are responsible for reporting to MET, as part of their permit regulations, and the majority of the research reports are in the library at the Gobabeb Centre and included in Annex 21.

Support for complementary research by visiting scientists was recently initiated at the private NamibRand Nature Reserve just outside the eastern boundary of the identified Property. Similarity of the landscape means that many of the results could be applicable to the Namib Sand Sea.

Conservation of special attributes of the Namib Sand Sea is supported by the designation of Sandwich Harbour as a Ramsar Site and zoning in the Namib Sand Sea. Day visits are popular with bird watchers and support a thriving tourism industry. The geographic area of Sandwich Harbour itself is very dynamic, continually changing shape, size and character as the long-shore currents move sand northwards and winds sculpt the landscape. Nevertheless, the area with its fresh water seepages and tidal flats is well conserved and an important element of the Property.

The results of the long-term, ongoing research from the Gobabeb Centre, as well as the outcomes of the extensive tourism developments in the area, contribute greatly to the promotion of the sand sea as an icon and symbol of Namibia and desert landscapes in general and will continue to contribute to promotion of the Namib Sand Sea as a World Heritage Site.

4.b FACTORS AFFECTING THE PROPERTY

(i) Development Pressure

All human activities within the nominated Property take place under the jurisdiction of the Ministry of Environment and Tourism (MET) with the Ministry of Mines and Energy (MME) presently being the most important other national authority. Tourism and mining represent the two key development pressures. Visitor/ tourism pressures are described under Section iv below.

Most of the Namib Sand Sea is surrounded by Exclusive Prospecting Licences (EPLs) for uranium and other minerals. EPLs along the western and northern edges of the Property are speculative, are not being actively prospected and, upon expiry, will be withdrawn permanently by the MME who grant the EPLs. No new EPLs will be granted within the designated Property by the Ministry. This protection from active prospecting will be guaranteed through a pending cabinet decision.

Any future mining activity would thus be precluded by the cabinet decision backed by the Inter-Ministerial Policy on Prospecting and Mining in Protected Areas and National Monuments (1999) and the environmental clauses in the Minerals (Prospecting and Mining) Act No. 33 (1992), the Environmental Assessment Policy (1995) as well as the Environmental Management Act of 2007.



(ii) Environmental Pressure

Negative environmental pressures on the Namib Sand Sea are almost entirely absent. Located in a hyper-arid environment, the climate is naturally very variable ranging from decades of aridity, to occasional exceptionally high rainfall years. In this hyper-arid environment, climatic extremes are to be expected and mortalities, primarily of larger game animals, will be monitored on an ongoing basis.

Fire is a potential pressure on the eastern plains bordering the Namib Sand Sea. This is likely to happen after infrequent good rain years followed by a flush of ephemeral grasses. The resultant grasslands are then vulnerable to lightning strikes and possible wildfire at the beginning of the following rain season. Fires from lightning in the eastern plains would not expand far into the sparse vegetation of the Namib Sand Sea. However fires may destroy the grazing for the larger herbivores until new growth appears after the next rain, which may not happen for many years. Outbreaks of wildfire also destroy multiple smaller fauna as well as the flora and present an abrupt transition in the ecological status from a bountiful environment to the usual barrenness expected of desert habitats.

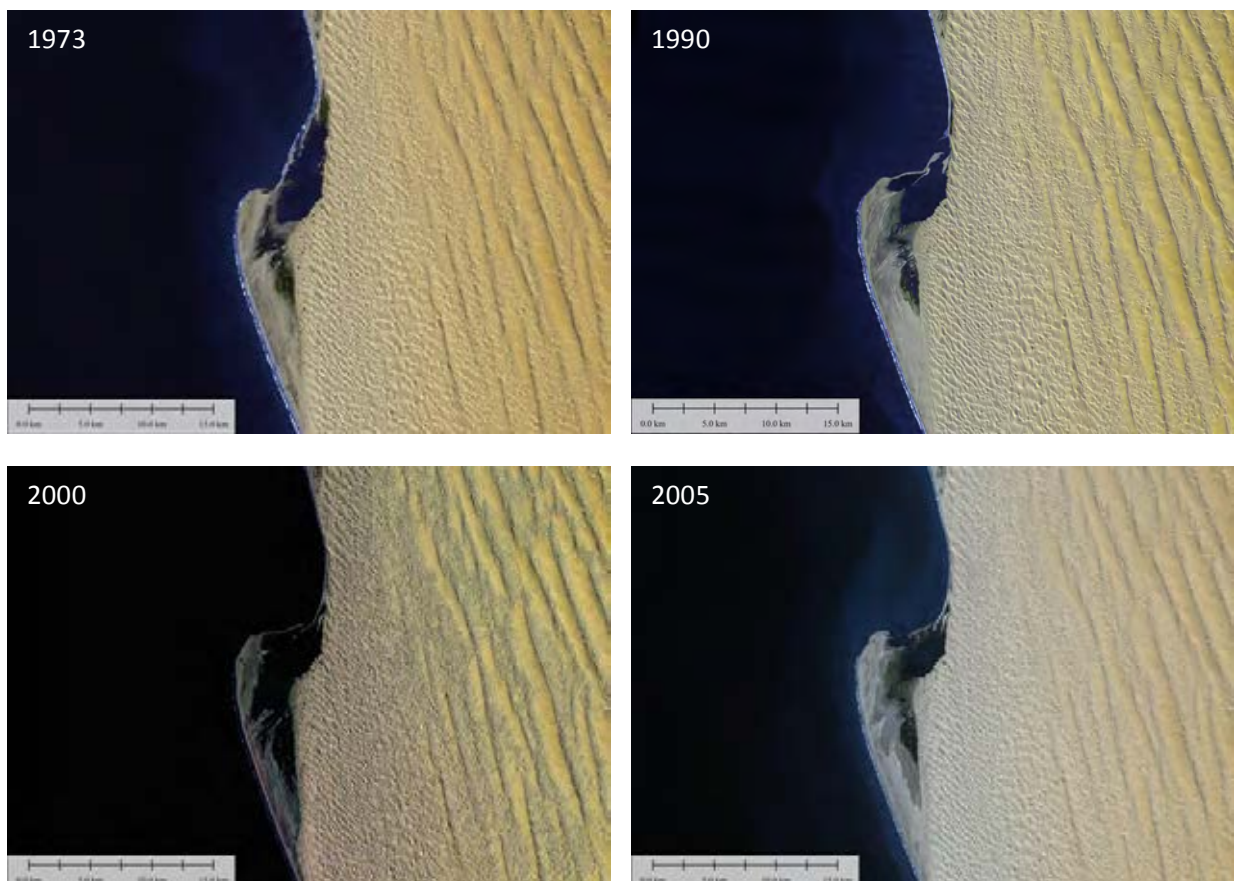


Figure 4.b.1: The Namib Sand Sea is a very variable environment as exemplified in the rapid changes in the habitat structure of the Sandwich Harbour Ramsar Site (Swart/NASA)



Floods are another potential environmental pressure. Exceptionally high rainfall years resculpt the landscape by massive but short-lived floods in some ephemeral rivers flowing into the Namib Sand Sea. These events may occasionally drown unaware fauna or uproot trees in the watercourse. At the same time, the floods lead to rejuvenation and regrowth of the woody and shrubby vegetation. Floods are generated on the escarpment to the east of the Namib Sand Sea and inundate the ephemeral watercourses and their terminal endorheic pans. These floods are part of the natural dynamics of the variable arid climate and, while changing the topography for years, decades or centuries, would not cause disturbance beyond the natural capabilities of the environment to adapt.

Climate change, on the other hand, has the potential to influence the Namib Sand Sea. Warming of the Benguela Coastal Current could decrease the frequency and extent of fog occurrences over the Property as well as cause more frequent floods and rainfall events. A decrease in fog would have an impact on the occurrence and distribution of the fauna and flora that depend on fog as a primary or supplementary water source through range contraction and lower population densities. Similarly, ocean warming would change the wind regime that could influence the key factor that supplies the sand for the Namib Sand Sea and redistributes it throughout the erg. Shorter, more intense rain seasons are also predicted with climate change. This could influence flood regimes of the ephemeral rivers – perhaps causing more intense, short floods from the neighbouring escarpment. In combination with these effects, climate change is likely to stimulate the natural variability of the Namib Sand Sea through range and population contractions and extensions of different species as local conditions in the dunes change. These conditions may become more pronounced through climate change but are unlikely to result in effects outside the natural variability of the current environment.

Exotic or alien species currently pose no threat to the values of the Property. Some domesticated and introduced plants and animals occur within the buffer zone but only as vagrants inside the Property. These are mainly used for agricultural production, transport, or psychological well-being. A feral horse population occurs in the southern buffer zone, and the occasional feral cat, dog, or donkey may stray into the Namib Sand Sea. Invasive or adventive aliens (Table 4.b.1) are also more common in the buffer zone but rare inside the Property. Those posing the biggest threat, e.g. *Prosopis*, *Opuntia* and *Rattus*, are actively managed and mostly eradicated. Plant species spreading along ephemeral rivers and frequently re-introduced such as *Nicotiana*, *Datura* and *Ricinus* are irritating to all environmentalists but pose little risk. Most of the established alien populations of other species contribute to and do not interrupt natural ecological and geomorphological processes.

Table 4.b.1: Adventive exotic species recorded from the Namib Sand Sea

Family	Genus	Species	Common name	Occurrence within Namib Sand Sea
Apocynaceae	<i>Nerium</i>	<i>oleander</i>	Oleander	Human settlements
Euphorbiaceae	<i>Ricinus</i>	<i>communis</i>	Castor bean	Ephemeral rivers
Fabaceae	<i>Prosopis</i>	<i>glandulosa</i>	Prosopis tree	Ephemeral rivers, mostly eradicated
Papaveraceae	<i>Argemone</i>	<i>orchroleuca</i>	Mexican poppy	Ephemeral rivers
Poaceae	<i>Arundo</i>	<i>donax</i>	Arundo	Ephemeral rivers
Poaceae	<i>Cynodon</i>	<i>dactylon</i>	Cynodon	Human settlements (also



				abandoned)
Solanaceae	<i>Datura</i>	<i>ferox</i>	Thorn-apple	Ephemeral rivers
Solanaceae	<i>Datura</i>	<i>innoxia</i>	Thorn-apple	Ephemeral rivers
Solanaceae	<i>Datura</i>	<i>metel</i>	Thorn-apple	Ephemeral rivers
Solanaceae	<i>Datura</i>	<i>stramonium</i>	Thorn-apple	Ephemeral rivers
Solanaceae	<i>Nicotiana</i>	<i>glauca</i>	Wild tobacco	Ephemeral rivers
Cyprinidae	<i>Cyprinus</i>	<i>carpio</i>	Common carp	Rare Vagrant after floods
Columbidae	<i>Columba</i>	<i>livia</i>	Feral pigeon	Human settlements (also abandoned)
Ploceidae	<i>Passer</i>	<i>domesticus</i>	House sparrow	Human settlements (also abandoned)
Muridae	<i>Mus</i>	<i>musculus</i>	House mouse	Human settlements (also abandoned)
Muridae	<i>Rattus</i>	<i>rattus</i>	Common house rat	Eradicated
Pholcidae	<i>Pholcus</i>	<i>phalangioides</i>	Long-legged spider	Human settlements (also abandoned)
Pholcidae	<i>Smeringopus</i>	<i>pallidus</i>	Long-legged spider	Human settlements (also abandoned)
Theridiidae	<i>Latrodectus</i>	<i>geometricus</i>	Black-widow spider	Sandwich Harbour, human settlements
Uloboridae	<i>Uloborus</i>	<i>plumipes</i>	spider	Sandwich Harbour
Lepismatidae	<i>Ctenolepisma</i>	<i>longicaudata</i>	Silverfish	Human settlements (also abandoned)
Blatellidae	<i>Blatella</i>	<i>germanica</i>	Kitchen cockroach	Human settlements (also abandoned)
Cerambycidae	<i>Arhopalus</i>	<i>ferus</i>	Longhorn seetle	Beach driftwood
Ptinidae	<i>Stethomezium</i>	<i>squamosum</i>	Ptinid seetle	Coastal area
Gryllidae	<i>Acheta</i>	<i>domestica</i>	Cricket	Human settlements (also abandoned)
Gryllidae	<i>Gryllus</i>	<i>bimaculatus</i>	Cricket	Human settlements (also abandoned)
Pthiridae	<i>Pthirus</i>	<i>pubis</i>	Pubic lice	Human ectoparasite
Pulicidae	<i>Pulex</i>	<i>irritans</i>	Common flea	Human settlements (also abandoned)

(iii) Natural Disasters and Risk Preparedness

No known potential natural disasters or risks have been identified that may threaten the values of the Namib Sand Sea with the exception of fire and flood as described in the section above. The potential of marine pollution, e.g. oil spills, along the western boundary has been considered but will not affect any of the attributes that will contribute to the OUV of the Property. Nevertheless, risk preparedness is undertaken by three ministries, Ministry of Environment and Tourism (MET), Ministry of Fisheries and Marine Resources (MFMR) and Ministry of Mines and Energy (MME). These threats would be managed jointly by the MET and MFMR if they affect the area between high and low tide. The Ministry of Mines and Energy and Ministry of Fisheries and Marine Resources would be involved if the spill occurred off-shore.



Figure 4.b.2: Fire is one potential natural hazard which inevitably follows good rainfall events caused by dry lightning at the beginning of the next rain season (2011, Gobabeb Centre)

Fire management planning and directives for fire suppression are in place for the Namib-Naukluft Park. Experienced staff with suitable equipment ensures that the effect of outbreaks of wildfire is constrained and guide new staff that were trained in the principles of fighting fires, but without practical experience. Areas prone to outbreaks are known, e.g. areas subject to frequent lightning strikes, while an effective communication and rapid-response system allows additional manpower and equipment to be recruited for very large outbreaks, whether in the park or not. Long-term management experience shows that fire is part of the landscape-level ecological processes, thus total suppression is not desirable or required.

(iv) Visitor / Tourism Pressure

The Ministry of Environment and Tourism is responsible for control of all visitors and tourism in the identified Property. Visitors entering through the Sesriem gate to visit Sossus Vlei increased from a recorded 58,800 during 2005/06 to 102,250 in 2011. Similarly there was an increase of permits recorded for Ganab from 20,700 in 2005/06 to 34,000 in 2011. Detailed numbers are provided in Table 5.h.1.

Because of the vast distances involved and relative inaccessibility of the Namib Sand Sea, short scenic flights of several hours duration are one of the common tourism activities over the identified area. However, low flying aircraft over the Sandwich Harbour wetlands, Tsondab Vlei, Sossus Vlei, Gobabeb and other areas of the Property or buffer have been and will continue to be a law enforcement challenge. Low flying aircraft, that is aircraft flying at less than the gazetted legal elevation of 1000 m over a park, disturb the tranquillity of the area and have an adverse effect on wildlife. The breeding success of the Lappet-faced Vulture, *Aegyptius tracheliotos*, seems to have fluctuated in the past ten years, possibly as a result of this pressure. Although regulations to control this pressure are in place, innovative approaches to resolve this threat are required.



Figure 4.b.3: Heavy tourism traffic to Sossus Vlei 2x4 parking lot warranted a 60 km tarred road to reduce dust and ease road maintenance (Gobabeb Centre)

Tourism takes place directly under the control and regulation of the Ministry of Environment and Tourism. Management is either implemented directly by the ministry itself, as at Sossus Vlei, or under the management of a variety of tourism concessionaires granted authority by the ministry. The area of dunes impacted by four-by-four travel is estimated to represent no more than 10% of the Namib Sand Sea.

Tourism development pressures are varied but are judged high overall considering the nature of the Namib Sand Sea. Travel within the Namib Sand Sea has increased exponentially over the past two decades. It is currently restricted to four-by-four vehicles with purportedly experienced guides and drivers. If carried out as required, the tourist groups only travel on designated tracks when traversing solid substrates. The remainder of four-by-four travel is restricted to dune surfaces that are rapidly restored by wind. Overnight camps take the form of fly-camps where no evidence of their occupation



Figure 4.b.4: Access to the in-point of the Tsauchab River where the highlights of Dead Vlei and Sossus Vlei are found is facilitated by public 4x4 transport (Gobabeb Centre)

is left behind. The tourist road to Sossus Vlei was tarred in the last decade as the track became progressively broader because of drivers attempting to avoid ruts and corrugations. In addition, the exponential growth in visitor numbers resulted in an almost permanent dust cloud in the Tsauchab Valley that obscured the spectacular view and increased accidents with other vehicles and wildlife. With well-controlled road contractors maintaining the road, this pressure has been eliminated.

Waste management is another development pressure associated with tourism in the Namib Sand Sea. MET has been experimenting with waste removal from Sossus Vlei itself, which poses particular problems as a high-density tourism destination. One current plan is to install holding tanks that are emptied by bowsers, with the waste being safely disposed well outside the Namib Sand Sea in evaporation ponds. Dehydration toilets would be an alternative. Tourism guides must make arrangements for their clients to remove all human waste from the sand sea. This may consist of portable toilets or similar devices. This and all other waste is removed from the area and disposed of in one of the coastal towns servicing the area.



Figure 4.b.5: One of approximately 60 tourism lodges catering for tourists visiting the Namib Sand Sea (Gobabeb Centre)

Development pressures from tourism also include continual requests to open up new areas for exclusive access, particularly on the eastern edge of the Namib Sand Sea. This demand is likely to remain a constant issue as the number of tourists increases and the perception that the existing 'desert solitude experience' is diminished. To date the Ministry of Environment and Tourism has not set a cap on the number of tourists allowed into Sossus Vlei as the main attraction, or throughout the entire Sand Sea, although this approach is being discussed. It is strongly recommended that zonation, caps on different types of use and creative, adaptive tourism management planning should be introduced as tourism continues its inexorable increase.



The increase of tourism establishments bordering the Namib Sand Sea, with up to 60 establishments in the greater catchment area for Sossus Vlei alone, has influenced conservation of the sand sea in at least three different ways. By accommodating more tourists who expect to experience the Namib Sand Sea, these private enterprises have contributed to the development pressure – although this is often only a fairly quick morning drive to Sossus Vlei where a tall dune can be climbed and photographs taken. On the other hand, some of the establishment operators have diversified the tourism offerings in the immediate vicinity of the Namib Sand Sea thus showing the potential for relieving the pressure on the protected area itself. Such diversified offerings may range from guided dune walks and nature related activities to marketing aspects such as the geology and evolution of the bordering Great Western Escarpment and other elements of the magnificent landscape. Alternatives also include ballooning and flights over and on the border of the Property. A third change, as tourism experiences evolve, is the increasing involvement of local inhabitants from the surrounding regions.



Figure 4.b.6: Most visitors experience the Namib Sand Sea on foot, etching images of the landscape into their memory forever (Fennessy)

Moreover, the increase in tourism and associated enterprises and facilities has, reciprocally, highlighted the attractiveness and importance of the Namib Sand Sea leading to greater attention to its conservation. Tourism operators, through their individual efforts, have extended the variety of tourism attractions in the vicinity of the identified Property. While not directly impinging on the Namib Sand Sea, these developments have created diversity and enhanced the regional tourism product. Currently (September 2011) a

programme designed to explore, initiate and develop modalities of co-management between MET and the surrounding private tourism establishments is being implemented. Establishment of World Heritage status would greatly enhance the attractiveness as well as the management potential of the Namib Sand Sea.

(v) Number of inhabitants within the Property and the Buffer Zone

Estimated population located within:

Area of nominated Property: **0**

Buffer zone:

maximum 400

ca. 110 Namibia Wildlife Resorts (NWR) and MET in the east

ca. 270 in Topnaar community and

ca. 20 at Gobabeb Centre in the north

Total:

maximum 400

Year:

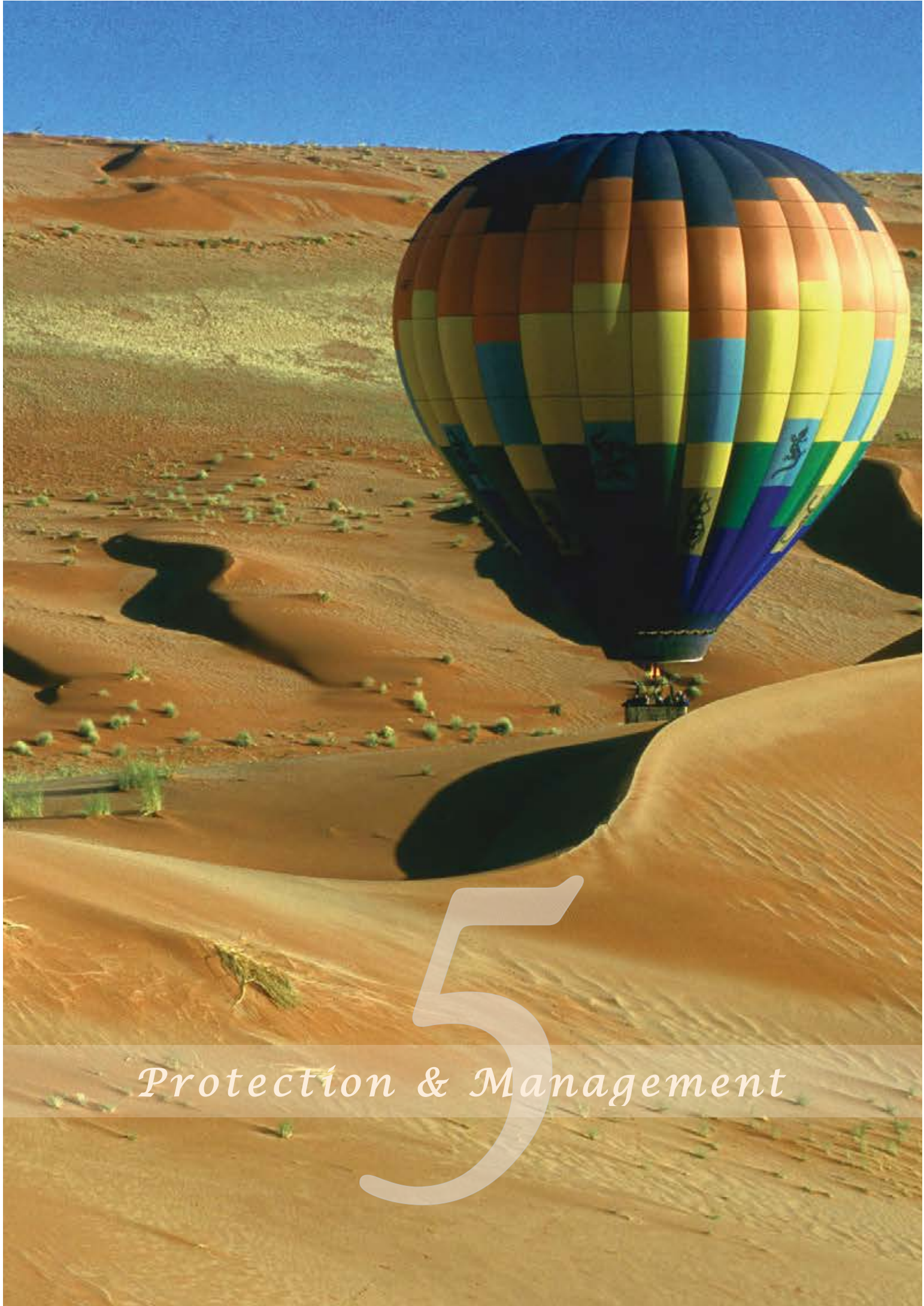
2011

There are no inhabitants in the nominated Property. Some permanent inhabitants of the buffer zone (approximately 110) are employees of the Ministry of Environment and Tourism and its affiliated state owned enterprise Namibia Wildlife Resorts and sub-contractors. They are concerned with tourism at Sesriem, the campsite nearby the entrance gate for vehicular traffic to Sossus Vlei. In the buffer zone on the northern boundary of the Namib Sand Sea, rural members of the Topnaar community and residents of the Gobabeb Training and Research Centre live along the north bank of the Kuiseb River (approximately 250-300 people).



Figure 4.b.7: Tourist groups are guided to the Dead Vlei at Sossus Vlei (Gobabeb Centre)





5

Protection & Management



Ballooning – a tourism venture leaving only a light footprint in the Namib Sand Sea (Paul van Schalkwyk)

5

Protection and Management of the Property

5.a OWNERSHIP

All of the nominated Property is state owned. It falls within the Namib-Naukluft Park, which is an integral part of the planned Namib-Skeleton Coast National Park.

Table 5.a.1: Overview of land ownership of the nominated Property.

Area	ha	km ²	Ownership
Namib Sand Sea	3,077,700	30,777	State owned
Buffer zone, all within the Namib-Naukluft Park	899,500	8,995	State owned

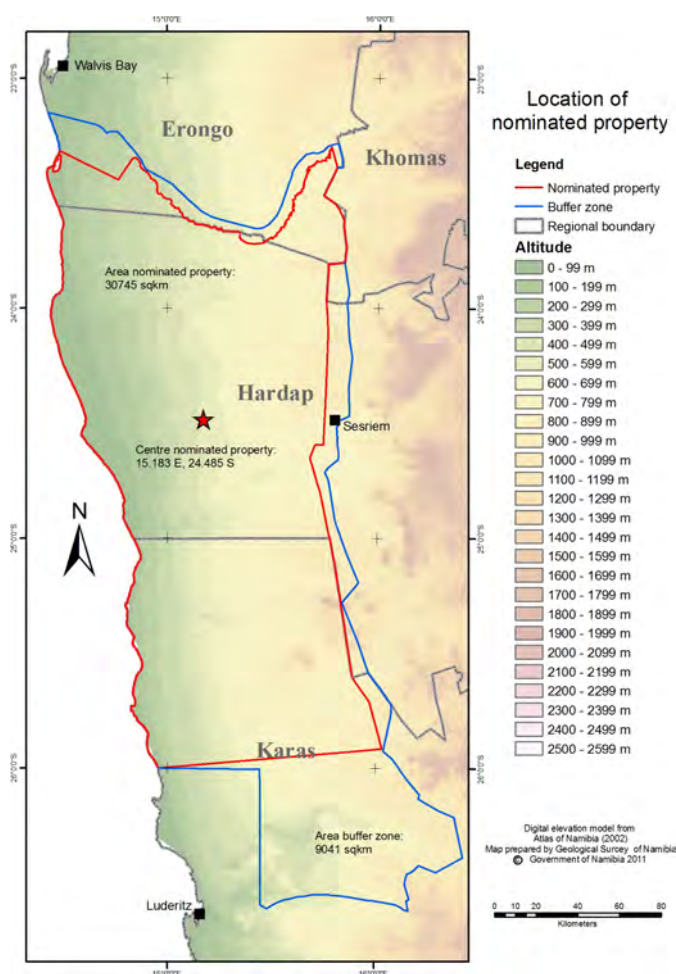


Figure 5.a.1: The buffer zone (blue line) follows the borders of the Namib-Naukluft Park in the west, south and east, while the northern boundary parallels the Namib Sand Sea. The Namib Sand Sea (red line) with its buffer zone is part of the Namib-Naukluft Park and is owned and protected by the Ministry of Environment and Tourism of the Government of the Republic of Namibia

5.b PROTECTIVE DESIGNATION

The Namib Sand Sea as an integral part of the Namib-Naukluft Park is subject to comprehensive protection on a national basis. It falls directly under and is managed by the Ministry of Environment and Tourism (MET). Much of the research and monitoring of the Namib Sand Sea environment is carried out by the Gobabeb Training and Research Centre (Gobabeb Centre) located on the northern border of the identified Property.

The legal establishment of the Namib-Naukluft Park occurred during seven different steps dating from the first decade of the 20th Century. The first proclamation as a game reserve took place in March 1907 and encompassed the dunes directly south of the Kuiseb River on the northern edge of the Namib Sand Sea. In 1962 the Namib Desert Research Association was established at Gobabeb and evolved over the years. The Gobabeb Training and Research Centre is now a Joint Venture between the Ministry of Environment and Tourism and the NGO known as the Desert Research Foundation of Namibia.

In 1968 the Namib Desert Park and the Naukluft Mountain Zebra Park were declared as game parks under the Nature Conservation Ordinance (Ordinance 31 of 1967). This expansion encompassed parts of the dune sea inland from Sandwich Harbour eastward to the Kuiseb River course. These parks were withdrawn in 1975 and the area was integrated as the Namib-Naukluft Park and declared a game park in 1979 (Gazette No 118, 1 August 1979). This consolidated game park, encompassing most of the northern portion of the Namib Sand Sea, also incorporated the north-eastern portion of Diamond Area #2.

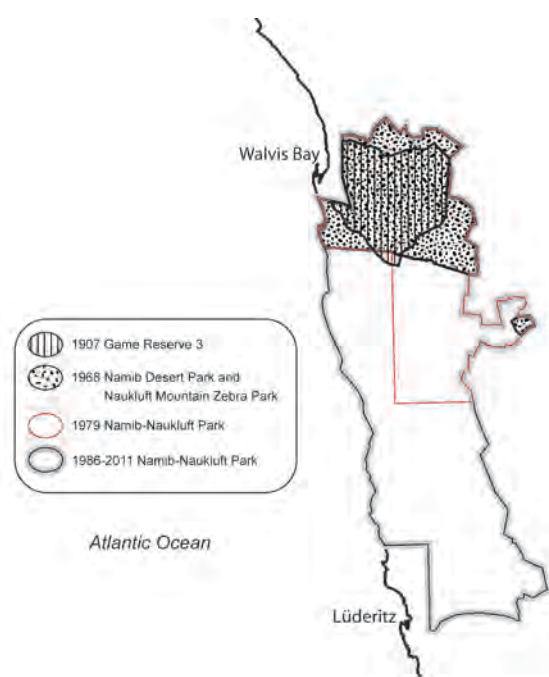


Figure 5.b.1: The Namib-Naukluft Park evolved to its current size over the past century (Robertson)

The boundaries of the Namib-Naukluft Park were amended and enlarged in 1986 under Section 15 of the Nature Conservation Ordinance, 1975 (Ordinance 4 of 1975). This included adding the remainder of Diamond Area #2 and the portion of Diamond Area #1 north of the Aus/Lüderitz road. By 1986 almost the entire Namib Sand Sea was afforded protection within the Namib-Naukluft Park. Two minor amendments of terminology and boundaries were made in 1989 and 1990 so that today the park covers an area of approximately 50,700 km² including the Namib Sand Sea.

Sandwich Harbour was declared a Wetlands of International Importance on 23 December 1995, under the Ramsar Convention. Tourism is currently the only use of Sandwich Harbour.

The southern part of the area borders on a Cabinet-approved Marine Protected Area. The entire inter-tidal zone bordering the identified Property is co-managed by the Ministry of Environment and Tourism and the Minister of Fisheries and Marine Resources.

Portions of the area are designated as an Important Bird Area (IBA) and qualify as a Key Biodiversity Area (KBA).

Currently the Namib Sand Sea is protected by a variety of plans, policies, legislation and regulations. All are derived from or support the Namibian Constitution, Article 95(l), which affirms that *'the State shall actively promote and maintain the welfare of the people by adopting ... policies aimed at maintenance of ecosystems, essential ecological processes and biological diversity of Namibia and utilization of living natural resources on a sustainable basis for the benefit of all Namibians, both present and future; ...'*

Policies represent statements of intent to carry out specific or general measures to support the governance of Namibia. Some of these policies focus directly on protecting and managing natural resource assets throughout Namibia while others indirectly affect such management and protection. A number of the relevant policies have been summarized in Table 5.b.1 below (see also Table 5.c.1). While the majority of the listed policies do not specifically mention the Namib Sand Sea, they do impinge on its protection and management. In most instances they relate, directly or indirectly, to the exceptional natural beauty and aesthetic importance of the Property (Criterion vii) and to its *in-situ* conservation of biological diversity (Criterion x). Those policies of particular importance are highlighted in bold:




Figure 5.b.2: Protection of the Namib Sand Sea is afforded by policies, legislation and regulations of the Ministry of Environment and Tourism. Vehicle access is limited to designated areas, leaving a major section of the sand sea pristine for exploring on foot (Gobabeb Centre)

Table 5.b.1: Key elements of the policy framework relevant to protection of the Namib Sand Sea

Policies (directly relevant polices are indicated in bold)	Relevance to natural criteria			
	vii	viii	ix	x
Decentralisation Policy, 2000	X			X
Environmental Assessment Policy, 1993	X	X	X	X
Food and Nutrition Policy, 1995	X		X	X
Marine Protected Area Feasibility Study, no date	X	X	X	X
Marine Resources Policy 2004	X	X	X	X
Namibian Drought Policy and Strategy, 1997	X	X	X	X
Namibia's Policy to Combat Desertification, 1994	X	X	X	X
Namibia Tourism Board Marketing Plan, 2004	X	X	X	X
Namibia Tourism Policy, 2006	X	X	X	X
National Agricultural Policy, 1995	X		X	X
National Biodiversity Strategy and Action Plan, 2001 - 2010	X		X	X
National Gender Policy, 1998	X			X
National Land Policy, 1998	X	X	X	X
National Policy on Tourism for Namibia, 2008	X	X	X	X
National Water Policy White Paper, 2000	X	X		X
Policy on Tourism and Wildlife Concessions on State Land, 2007	X	X	X	X
Poverty Reduction Strategy for Namibia, 1998	X		X	X
Tourism Industry Charter, 2004	X	X	X	X
Towards a Coastal Policy of Namibia, 2009	X	X	X	X
Vision 2030, 2005	X	X	X	X
Water Supply and Sanitation Sector Policy (revised), 2008	X	X	X	X
Wetlands Policy, 2004	X	X	X	X
White Paper on Energy Policy, 1998	X	X		X
Wildlife Management, Utilization and Tourism in Communal Areas Policy, 1995	X		X	X

The Ministry of Mines and Energy has the right to issue Exclusive Prospecting Licences over the area but has agreed to let those that currently exist run their allocated duration before being withdrawn (Cabinet submission November 2011). Meanwhile, the entire area is excluded from the granting of new licences.

Based on consideration of the above as well as the active prospecting in EPLs in the Koichab Pan south of the sand sea and the use of the Koichab fossil aquifer as a water supply for Lüderitz, the boundaries of the identified Property designated as the Namib Sand Sea were established to encompass all four natural criteria.

- 
- The 30,777 km² area contains superlative natural phenomena and vast areas of exceptional natural beauty and aesthetic importance. A portion of the sand sea was allocated to the buffer area to the south where the criteria are also met but potential also exists for more intrusive tourism developments.
 - The boundaries were designed to incorporate this outstanding example of the interplay of marine, atmospheric and terrestrial processes encompassing major stages of the earth's history as well as significant ongoing geological, geomorphic and physiographic processes. The fossil dune desert, the Tsondab Sandstone Formation, extends beyond the current active dune desert. The boundaries encompass a large proportion of the fossil dune desert underlying today's active dune desert. Again, buffering processes were allocated to the areas surrounding the identified Property to enhance its essential integrity.
 - Ongoing ecological and biological processes in the evolution and development of terrestrial ecosystems and communities of biota are fully encompassed within the boundaries of the identified Property. The Namib Sand Sea provides complete and ample coverage to ensure the continuation of these dynamic processes.
 - The boundaries were drawn to include the most important and significant natural habitats for the *in-situ* conservation of biological diversity represented by the Namib Sand Sea. These include species of Outstanding Universal Value from the point of view of science and conservation. The buffer areas within the Namib-Naukluft Park contribute to the conservation status of the nominated area but are not essential for its realisation within the identified Property.

5.c MEANS OF IMPLEMENTING PROTECTIVE MEASURES

Protective measures are supported by a variety of legislation, directly and indirectly impinging on the Namib Sand Sea. Table 5.c.1 provides an overview of the diverse legislative framework and its relevance to the four natural criteria relating to the identified Property. All of these pieces of legislation relate to the regulatory framework under which the Ministry of Environment and Tourism manages the Property. Many of these legislative elements are not actively invoked but are applied when required.

Much of the actual protection for the Namib Sand Sea has been indirectly achieved because of its past history and the current inaccessibility and isolation of the Property. Until 1979, the entire Namib Sand Sea was designated as Diamond Areas #1 and #2 and protected under the strict diamond mining regulations. In 1979, the northern half of the Namib Sand Sea previously designated as part of Diamond Area #2 was incorporated into the Namib-Naukluft Park. The remainder of the Namib Sand Sea was incorporated into the Namib Naukluft Park only in 1986, by redesignating the remainder of Diamond Area #2 and that portion of Diamond Area #1 inland from the coast and north of the Aus-Lüderitz road. Thus until firmly integrated into the Namib-Naukluft Park, the Property was essentially off limits to the public with entry allowed only under a strict permitting system. This system did not include entry for tourism but only endeavours such as research with various objectives ranging, for example, from identifying sources of groundwater or elucidating the geology to investigating biodiversity of the inselbergs or structure of the dune array.

Table 5.c.1: Key elements of the legislative framework relevant to management and implementing protective measures of the Namib Sand Sea


Legislation (directly important legislation is indicated in bold)	Relevance to natural criteria			
	vii	viii	ix	x
The Access to Genetic Resources Bill, 2010	X			X
Agriculture (Commercial) Land Reform Act, 1995	X		X	X
Cooperatives Act, 1996	X			X
The Environmental Investment Fund of Namibia Act, 2001	X		X	X
Environmental Management Act, 2007	X	X	X	X
Foreign Investment Act, 27/1990	X			X
Forest Act, 2001			X	X
Game Products Trust Fund Act, 1997	X	X	X	X
Inland Fisheries Resource Act, 2003				X
Labour Act, 1992	X			X
Local Authorities Act, 1992	X			X
Locust Suppression Proclamation, 34/1923	X		X	X
Marine Resources Act, 2000				X
Minerals (Prospecting and Mining) Act, 1992	X	X	X	X
Mountain Catchment Areas Act, 63/1970	X	X	X	X
Namibian Tourism Board Act, 2000	X	X	X	X
Namibia Water Corporation Act, 1997	X	X	X	X
Namibia Wildlife Resorts Company Act, 1998	X	X	X	X
National Heritage Act, 2004	X	X	X	X
National Monuments Act, 20/1969	X	X	X	X
The Nature Conservation Ordinance (1975) as amended through the Nature Conservation Amendment Act, 1996	X		X	X
The Parks and Wildlife Management Bill (will replace Nature Conservation Ordinance)	X		X	X
Petroleum (Exploration and Production) Act, 1991	X	X		
Petroleum Products and Energy Act, 13/1990	X			X
Plant Quarantine Act, 2008			X	X
The Pollution Control and Waste Management Bill	X	X		X
Regional Councils Act, 1992	X			
Soil Conservation Proclamation, 76/1969	X	X	X	X
Territorial Sea and Exclusive Economic Zone of Namibia Act, 1990	X			X
Traditional Authorities Act, 175/1995	X		X	X
Water Proclamation, 54/1956 (will be replaced by Water Resources Management Bill)	X			X
Water Resources Management Bill, 2004			X	X
Wild Birds Protection Proclamation, 6/1967	X		X	X

Under the MET, the strict protected status of the Namib Sand Sea has been maintained. Daily entrance is only by permit to two well-patrolled designated areas, i.e. Sandwich Harbour and Sossus Vlei. Concessions have been granted recently along designated routes elsewhere in the area (e.g. Section 4.a) with, in addition, each individual visit led by a concessionaire with a permit from MET.

Providing another backbone to the framework for implementing protective measures are the various Multilateral Environmental Agreements (MEAs) established by the United Nations and other multilateral agencies (Table 5.c.2). Namibia is a signatory to a number of Multilateral Environmental Agreements that influence the protection and management of the designated Property. These MEAs may be invoked to contribute to protective measures but are considered by Namibia as secondary to the national legislation.

Table 5.c.2: Multilateral environmental agreements influencing the protection and management of the Namib Sand Sea.

Multilateral Environmental Agreement	Relevance to natural criteria			
	vii	viii	ix	x
Compensation of Oil Pollution Damage, 1971, as replaced by the 1992 Protocol – effective 2003	X	X	X	X
Convention Concerning the Protection of the World Cultural and Natural Heritage, 1972 – effective 2000	X	X	X	X
Convention for the Safeguarding of the Intangible Cultural Heritage, 2003 – effective 2007	X	X	X	X
Convention of the Protection and Promotion of the Diversity of Cultural Expressions, 2005 – effective 2007	X		X	X
Convention on Biological Diversity, 1992 – effective 1997			X	X
Convention on the Conservation and Management of Fishery Resources in the South East Atlantic Ocean, 2001 – effective 2001			X	X
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 1973 – effective 1991			X	X
Convention on Wetlands of International Importance, especially as Waterfowl Habitat, 1971 (Ramsar Convention) – effective 1995	X		X	X
International Convention on Civil Liability for Oil Pollution Damage, 1969, as replaced by the 1992 Protocol, as amended in 2000 – effective 2003	X	X	X	X
International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990 – effective 2007	X	X	X	X
SADC Protocol on Fisheries, 2001 – implemented 2003			X	X
SADC Protocol on Wildlife Conservation and Law Enforcement, 1999 – implemented 2003			X	X
United Nations Convention on the Law of the Sea, 1982 – effective 1994	X	X		
United Nations Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, particularly in Africa, 1994 – effective 1997	X	X	X	X
United Nations Framework Convention on Climate Change, 1992 – effective 1995	X	X	X	X
World Heritage Convention, 1975 – effective 2000	X	X	X	X



As espoused in the Management and Tourism Development Plan for the Namib-Naukluft Area, covering the period 2009–2013, use of the area is planned and managed to retain a ‘Desert Discovery’ atmosphere. This encompasses safeguarding its wilderness and ‘sense of place’ attributes within a zonation and management framework under the Environmental Management Act of 2007.

Protective measures are driven by the Ministry of Environment and Tourism (MET) but also involve consultation with the Ministry of Fisheries and Marine Resources and park neighbours. The Ministry of Mines and Energy supports identified protective measures. Nevertheless, the designated Property is entirely under the jurisdiction of the MET.


An essential element contributing to protective measures for the Namib Sand Sea is an extensive ‘informal buffer zone’ provided by privately owned land on the eastern boundary of the Namib-Naukluft Park. Many privately owned farms actively practice conservation, e.g. NamibRand Nature Reserve, and many are in the tourism business, thus contributing to conservation generally. However, until recently each owner managed his/her property according to his/her own guidelines and there was no coordinated approach.

Plans are ongoing to establish a Namib Co-management and Development Plan with local landowners extending 180 km along the eastern border of the identified Property from NamibRand north to Solitaire. This will be legally constituted under law as the Private Protected Areas Association of Namibia. Conservation, monitoring and adaptive management of this area will be the key objective of the association. Moreover, this area will be integrated into a Protected Landscape Conservation Area to be known as the Greater Sossus Vlei-Namib Landscape that is currently being established under the NamPlace project of MET funded by the Global Environmental Facility.

However, at this time there is no domestic legislation in place that will ensure compliance with conservation objectives and principles by landowners. Compliance will be voluntary. World Heritage inscription requires the management authority of the state party, which is the MET for the Namib Sand Sea, to ensure appropriate management. At present it is not possible for the MET to enforce compliance on private land. Thus all private land has been excluded from the buffer zone. This may change in the future as co-management practices mature.



Figure 5.c.1: Appropriate road signs allow MET to facilitate natural rehabilitation by redirecting traffic along designated routes (Gobabeb Centre)



Conservation and tourism endeavours along the eastern border of the Namib-Naukluft Park contribute to protection of the identified area itself, as the east represents the main area of potential access to the Property. The level of protection has increased as the number of tourism ventures increases. The success of conservation in the area has demonstrated that conservation-focused land use far outweighs livestock farming and contributes significantly more to social, economic and environmental benefits for all involved. Moreover, conservation and tourism bring more to the national economy, provide more jobs and have less impact on the environment. Evidence of this is indicated by the 10-fold increase in land values over the past decade. Thus the identified Property of the Namib Sand Sea will benefit greatly from these privately owned enterprises that provide buffering processes to the identified Property and, in turn, are expected to benefit by the inscription of the World Heritage Site.

Protective measures for the Namib Sand Sea are augmented by the area of the Namib-Naukluft Park that extends to the north of the identified Property beyond its northern buffer area. Moreover, Dorob National Park then extends further northwards along the coast and the Sperrgebiet National Park lies to the south of the identified Property beyond its southern buffer area. The dangerous and inhospitable 'skeleton coast' forming the western boundary of the Namib Sand Sea provides protection from the west.

5.d EXISTING PLANS RELATED TO MUNICIPALITY AND REGION IN WHICH THE PROPOSED PROPERTY IS LOCATED

The entire area of the nominated Property is subject to a coherent protection and management system under the Ministry of Environment and Tourism in its designated status as part of the Namib-Naukluft Park. The Property itself is centrally located in the proposed Namib-Skeleton Coast National Park network that will include almost the entire coastline of Namibia from the Orange River in the south to the Kunene River in the north.

A variety of independent plans, some coordinated and others complementary but not formally coordinated, contribute to protection processes surrounding the identified Property, directly and indirectly. These range from the overarching Vision 2030 to regional and individual municipality and village plans. None of these plans override those of the Ministry of Environment and Tourism, thus the Namib Sand Sea is rarely referred to but they contribute to buffering of the designated area. Most of these plans simply generically recognise the importance of conservation areas as a magnet for tourism and associated development.

Table 5.d.1: National, Regional and Local plans supporting conservation of the Property

Plans (the key plans of MET are highlighted in bold)	Criteria			
	vii	viii	ix	x
Aus Village Tourism Development Plan	X	X	X	X
Erongo Regional Development Plan, 2001/2-2005/6	X			X
Gondwana Collection Strategic Plan (not reviewed)	X	X	X	X
Hardap Regional Development Plan, 2001/2-2005/6	X			X
Karas Regional Development Plan, 2001/2-2005/6	X			X
Lüderitz Municipality Development Plan	X			X
MET Management and Tourism Development Plan for the Namib-Naukluft Park, 2009-2013	X	X	X	X
MET Management Plan, 2003	X	X	X	X
MET Strategic Plan	X	X	X	X
MFMR Strategic Plan	X		X	X
Namibia Wildlife Resorts Strategic Plan (under review)	X	X	X	X
NamibRand Strategic Plan	X	X	X	X
NamPlace project	X	X	X	X
National Biodiversity Strategy and Action Plan, 2001 - 2010	X		X	X
National Coastal Management (NACOMA) Project	X	X	X	X
National Development Plan (NDP) III (2008), IV (2013) and ongoing	X			X
National Sanitation Strategy and Plan	X	X		X
National Tourism Board Strategic Plan (not available)	X	X	X	X
National Tourism Plan	X	X	X	X
Strategic Coastal Management Plan (Nacoma)	X	X	X	X
Supporting Protected Areas Network (SPAN) project (completed)	X	X	X	X
Vision 2030, 2005	X		X	X
Walvis Bay Municipality Development Plan	X			X
Wilderness Safari Strategic Plan (not reviewed)	X	X	X	X

5.e PROPERTY MANAGEMENT PLAN OR OTHER MANAGEMENT SYSTEM

A Management and Tourism Development Plan for the Namib Naukluft Park for the period 2009-2013 provides the basis for contemporary management actions. A draft Parks and Neighbours Policy, currently being developed, will contribute to indirectly support overall property management.

The "Namib Sand Sea Management Plan" (hereinafter the "Management Plan") has been drafted in order to properly conserve and manage the natural environment of the nominated Property well into the future. It is characterised by:



Wholeness: all necessary attributes to demonstrate the outstanding values of all four natural criteria are encompassed and abundantly represented within the identified Property.

Intactness: maintaining more than 80% of the identified area as undisturbed wilderness. The primary development process envisaged for the Namib Sand Sea is well regulated and there is controlled tourism access to identified parts of the nominated Property, with limited access for the purpose of science and management to the whole area.

Absence of threats: ensuring early identification of development challenges and identifying particular attributes that may come under stress through development. The precautionary principle, based on an ecosystem management approach and minimal intervention, will be used to test potential management approaches to likely anthropogenic impacts.

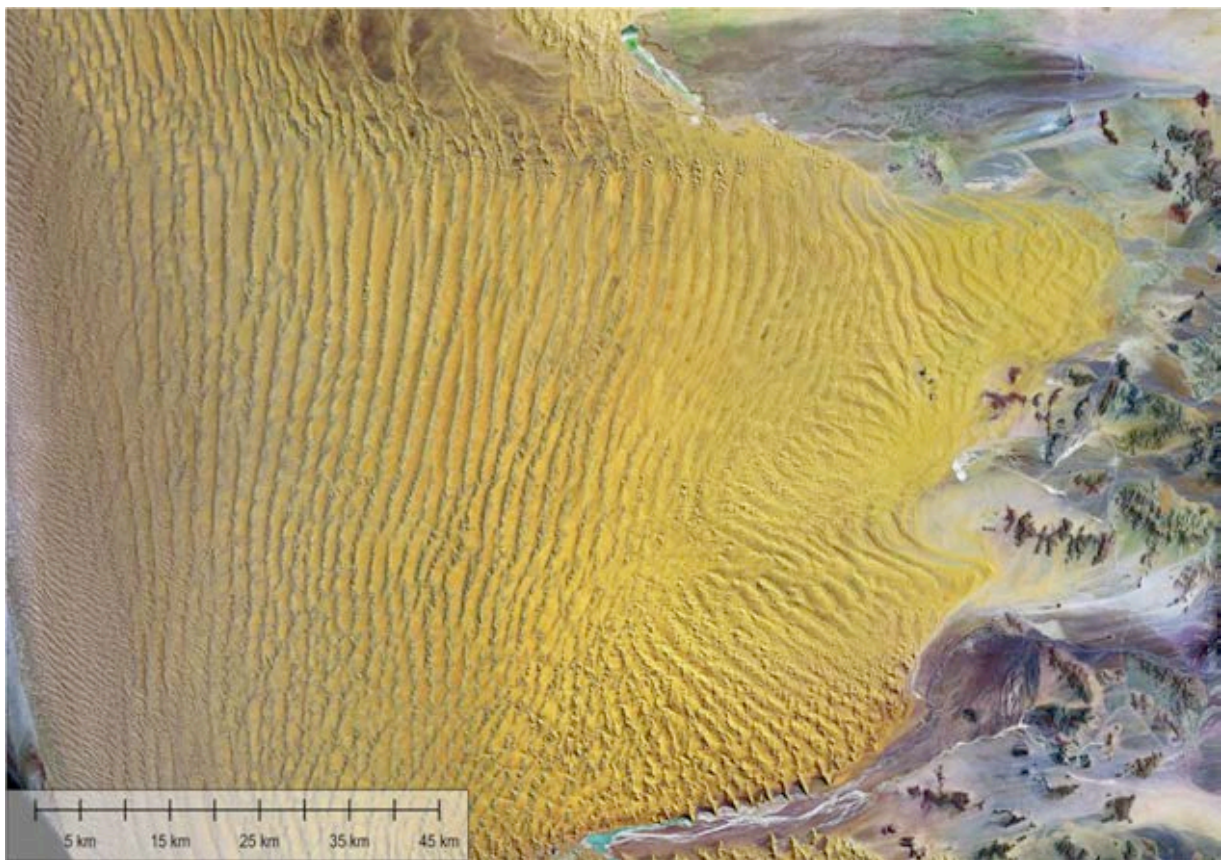



Figure 5.e.1: Intactness, wholeness and absence of threats are guaranteed by the immense expanse of the Namib Sand Sea (including myriad dune types, ephemeral rivers, bordering plains and mountains) included in the nominated Property (Swart/NASA)

The management vision for the Namib Sand Sea is to conserve the outstanding value of the natural environment of the nominated Property in perpetuity for the enjoyment and edification of all people. Within that context, the overall goal of the Management Plan is to conserve the austere but spectacular beauty and continuous expanses of majestic dunes of the Namib Sand Sea, including the outstanding diversity of endemic species integrated into vibrant and resilient communities. This is in a setting virtually devoid of human constructs and is a source of inspiration and enjoyment to Namibians and people of all cultures in the world. Appreciation for the dynamic processes that shape



and maintain the dunes, and the adaptations that allow life to flourish in an environment of limited resources, will be promoted and explained through continuous research and monitoring to increase the level of understanding. Ensuring the sense of place and awe that the Namib Sand Sea and its biodiversity invokes in the human spirit is a gift to humankind that Namibia will aspire to maintain despite the very human desire to conquer, to change, to exploit and to profit from the environment that they admire so much.


The Management Plan clarifies basic policies to facilitate the smooth and proper management of the Namib Sand Sea through close cooperation between the mandated management authority (the MET) and other related government organizations, decentralised local and regional governments, traditional societies, local residents, bodies engaged in tourism, researchers and NGOs. The Management Plan addresses issues such as conservation, research, monitoring, enforcement, education, traditional practices, and cultural heritage resources.

The Management Plan conforms to government policies and procedures related to the implementation of an integrated system of strategic (long-term), operational (medium-term), and activity (annual) planning. The Property is wholly on state land, thus is legally held in trust for the Namibian nation and subject to procedures for public asset management. Vast areas of the Property have been inaccessible or under conservation management for more than a century, during which time management approaches have evolved and adapted to ensure the best possible conservation outcome. During the long history of the conservation of the Namib Sand Sea, a diversity of management challenges based on emergent economic prospects, technological innovation, and socio-political imperatives had to be confronted. The nearly pristine condition of the nominated Property is evidence of the success of that past effort. The Management Plan is expected to evolve within the context of the management of surrounding public and private conservation areas, including participatory processes for the co-management of wilderness areas.

The direct management authority for the nominated Property is the Directorate of Regional Services and Parks Management within the Ministry of Environment and Tourism. Other organic bodies within its parent body have subsidiary responsibilities that have direct and indirect effects on management procedures. The integrated mechanisms through which all conservation areas and wildlife resources are managed in Namibia are intended to make optimal use of limited manpower and financial assets. It is not envisaged that the nominated Property will be managed in isolation. Although the management system has some



Figure 5.e.2: Control of off-road vehicle traffic is a major focus of the MET to maintain the pristine and splendid condition of the Namib Sand Sea (Gobabeb Centre)



disadvantages, as the Namib Sand Sea will not be managed as a distinct entity. However it does benefit from the flexibility of having access to a large potential resource base and being managed in accordance with a national system of a wider protected area network.

The outline of the Management Plan follows below. The full text of the Management Plan is included as Annex 1.

The Management Plan consists of two sections. Section 1, the management framework, includes key elements to move towards an ecosystem approach to management. The framework comprises the following elements:


- The legal and policy basis for managing the Namib Sand Sea
- The Vision and Guiding Principles that guide the development of policies and operational plans for the Namib Sand Sea
- Goals to guide the implementation of specific action plans to address priority management needs
- Regulations and zoning to manage human activities and threats
- Concepts to move toward a coordinated ecosystem approach to management
- Institutional arrangements for management coordination with stakeholders.

Section 2 includes key action plans to address priority management needs within the Namib Sand Sea and its buffer zone. Priority areas for management are:

- Conserving wildlife and their habitats
- Understanding and interpreting Namib Sand Sea resources
- Reducing threats to Namib Sand Sea resources
- Managing human activities
- Facilitating coordination
- Consistent management planning and implementation.

Each action plan consists of multiple strategies and activities to address one or more priority management area to achieve desired outcomes. Performance measures will be developed to evaluate implementation of the Management Plan. Additional activities to assess the health of the resources of the Namib Sand Sea are outlined in Section 6 'Monitoring' of this nomination document.

The ecosystem approach forms the principal philosophy for conservation and sustainable utilisation of the nominated Property. All habitats included within the Namib Sand Sea, consisting mainly of dune fields (erg), ephemeral riverbeds and associated riparian ecosystems, endorheic pans and vleis (terminal playas), inselbergs or mountain islands in the sand sea, tidal areas inclusive of estuaries, tidal inlets, salt marshes, beaches and the off-shore areas are covered by the conservation system in order to protect the ecological processes that are fundamental to the geomorphology, fauna, flora and ecosystem conservation.



An ecosystem approach to the management of the Namib Sand Sea requires that implementation of multiple activities have to be coordinated for:

- Ecosystem level planning
- Defining cross-jurisdictional management goals
- Developing and testing co-management approaches
- Adaptive management
- Ecosystem zoning
- Long-term observing, monitoring and research.

The Management Plan will be reviewed every five years. The review represents an essential element of the adaptive management process and includes public involvement, characterisation of issues, and review and evaluation of action plans and their outcomes. The review will incorporate lessons learned and new data and information from monitoring, ecosystem science, and traditional knowledge, along with a comprehensive evaluation to develop or refine management strategies and actions.



Figure 5.e.3: Permits are required to travel to Sandwich Harbour (Gobabeb Centre)

5.f SOURCES AND LEVELS OF FINANCE

The main source of finance for management of the proposed Property, located within the Namib-Naukluft Park, is the MET through the Ministry of Finance. There is no specific budget for the Namib Sand Sea, although Sesriem gate and associated facilities are dedicated to management of the identified Property. The level of finance allocated by the MET, based on a five-year future rolling budget system, is primarily intended for staffing and operational costs. It includes funding for monitoring of the Ramsar Site at Sandwich Harbour twice a year. Monitoring of other components of the Property is being undertaken by Gobabeb Training and Research Centre on the northern boundary of the Property, which is dependent on donor funding or consultancies for various elements of its programme. The amount available to the Centre for monitoring is less than N\$1 million annually. If this Property is designated as a World Heritage Site, options for additional funding would become available.




Figure 5.f.1: Signs, such as this one in the gramadullas, must be regularly budgeted for to replace weathered installations (Gobabeb Centre)

The allocation for fixed and operational costs for the last two years increased substantially from N\$9.682 million in 2010/2011 to N\$13.554 in 2011/2012. This budget covers the five central parks of which the Namib-Naukluft Park receives 50%. The Namib-Naukluft Park, which includes the Namib Sand Sea, is one of five 'central' parks that include Cape Cross Seal Reserve, Daan Viljoen Game Reserve, von Bach Recreation Resort and Waterberg Plateau Park. The regional heads (Chief Wardens) serve as cost centre managers who are given a budget to allocate for operational expenses, e.g. utilities, overtime, field allowances,

transport and office supplies, and services such as monitoring and other kinds of outsourced labour. The annual allocation for fixed and operational costs for 28 staff members of the Directorate of Regional Services and Parks Management and their activities remains relatively stable with a steady increase over the past five years.

Variable additional funding may be allocated to create new infrastructure, large maintenance projects, implementation of special programmes, e.g. game counts, fence repairs, and vehicle purchases. Such expenses are planned in advance to be included in the budget and prioritised for specific years. Serious emergency allocations requiring immediate attention may be approved by the Permanent Secretary.

Capital funding for the year 2011/2012 for the five central parks totalled N\$6 million specifically for upgrading tourist roads. Of this N\$1 million was allocated for upgrading the Sesriem Canyon road located in the buffer area of the identified Property within the Namib-Naukluft Park and an important part of the overall tourist experience in the area. N\$0.5 million was allocated for water provision to



game within the park. Yet another element of importance for the identified Property, although not directly within it, is the allocation of funding for preparation of a feasibility study to upgrade sewage treatment at Sesriem and Sossus Vlei. Overall the capital budget for the Namib-Naukluft Park for 2011/2012 totalled N\$2.4 million.

Funds from other directorates in MET contribute to management of the Namib-Naukluft Park, e.g. Scientific Services does game counts when requested and Environmental Affairs makes a contribution to maintenance of infrastructure at Gobabeb. The Game Products Trust Fund can be approached for specific requests such as the recent purchase of a radio system and vehicles to improve management effectiveness.

Should the nomination for the Namib Sand Sea as a World Heritage Site be approved, this development could be used to increase funding for the management and monitoring of the Property.

5.g SOURCES OF EXPERTISE AND TRAINING IN CONSERVATION AND MANAGEMENT TECHNIQUES

The MET provides the expertise in terms of conservation and management techniques for the Namib Sand Sea. This is backed-up by the Polytechnic of Namibia (PoN) which has a School of Natural Resource Management with a focus on agriculture, lands and natural conservation, and provides the main source of staff for the MET. The Polytechnic of Namibia grants Diplomas for three year courses, a B Tech degree based on a fourth year of study as well as MSc degrees. See Annex 22 for an extract from the curriculum, summarising relevant courses.

Additional to the Polytechnic of Namibia, the University of Namibia (UNAM) also offers a number of relevant courses in their Faculty of Agriculture and Natural Resources that could contribute to the knowledge of MET staff. See Annex 23 for a list of relevant courses at UNAM.

The Gobabeb Training and Research Centre has programmes that increase understanding of the Namib Sand Sea, the Namib desert in general and its conservation at all levels. In addition, it provides opportunities for students to do projects and undertake graduate degree research that contributes to understanding the desert environment and its conservation for future MET staff. Regular hosting of Polytechnic students to do in-service training and specialised courses for UNAM ensure that these institutions remain involved. Although not a degree-granting institution, the staff at Gobabeb co-supervise students for Diplomas, MSc and PhD degrees. When necessary other national specialist agencies are involved.



Figure 5.g.1: Skills and understanding are developed while studying the Namib Sand Sea (Gobabeb Centre)

5.h VISITOR FACILITIES AND STATISTICS

The vast majority of visitors to the Namib Sand Sea currently enter the Property via Sesriem Gate on the eastern boundary (Table 5.h.1). Sesriem is the entrance and administrative centre for visitors to Sossus Vlei and the Sesriem Canyon. A petrol station, small food and curio shop and a large bar and restaurant are located immediately inside the entrance. Visitor facilities at Sesriem consist of a campsite for 24 groups and the Sossus Dune Lodge of Namibia Wildlife Resorts (NWR) with 25 chalets (50 beds) (Table 5.h.2). A rudimentary interpretation centre at Sesriem used to provide some information about the Namib Sand Sea but was dismantled by NWR. The Management Plan makes provision for substantially upgrading information provided. A new amenity is the clinic currently being built that will support a full time doctor and four nurses to attend to visitors and staff alike.

Table 5.h.1: Visitor statistics for the Namib-Naukluft Park. Visitors entering through the Sesriem gate are all visiting the Namib Sand Sea, while permits issued elsewhere (combined as Ganab) may be used to visit parts of the Namib Sand Sea, e.g. Sandwich Harbour. Many of those with Ganab permits do not visit the Namib Sand Sea but other attractions in the Namib-Naukluft Park.

	2005/06		2009		2010		2011 ¹	
	Sesriem ²	Ganab	Sesriem ³	Ganab	Sesriem ³	Ganab	Sesriem ³	Ganab
Overseas	31,759	12,153	43,974	16,550	17,088	15,771	77,756	13,723
Africa	12,351	2,713	8,944	3,829	2,407	4,980	1,935	7,746
Namibia	14,703	5,869	5,076	9,245	1,935	9,267	9,673	12,560
Subtotal	58,813	20,735	57,994	29,624	21,430	30,018	89,364	34,029
TOTAL	79,548		87,618		51,448		123,393	


¹Until October 2011 ; ²Data compiled by SIAPAC 2007 ; ³Sesriem entry gate extremely unreliable

Inside the boundaries of the Property at Sossus Vlei, 60 km of tarred road along the Tsauchab River corridor leads to a 2x4 car park near Sossus Vlei. From there, a five km sand track exclusively for 4x4 vehicles guides visitors from the car park to further parking areas providing walking access to the Dead Vlei and Sossus Vlei itself. A shuttle service using six 4x4 vehicles is provided by NWR to ferry people from the 2x4 parking area to the further sites. One short gravel road ending in a designated parking area leads directly from the tarred road to Dune 45. From there visitors have easy access to climb this tall dune. All vehicle parking areas are clearly demarcated and provided with pit toilets, waste bins and picnic tables.

Table 5.h.2: Lodge occupancy at Sesriem, inside the Namib Naukluft Park

Lodge	Accommodation available	Annual average occupancy
Sossus Dune Lodge	50 beds in 25 chalets	60%
Sesriem Campsite	24 campsites (max. 8 people/campsite)	88%

Outside the park, at least 35 lodges and campsites are situated in the near vicinity to take advantage of the Namib Sand Sea. These lodges, with at least 660 beds, and the many associated campsites outside the park, enjoy an occupancy rate estimated at 60% – a tremendous economic engine in the



vicinity of the Namib Sand Sea. Tourists usually stay at the lodges for at least two nights with an early morning visit to Sossus Vlei in the Namib Sand Sea as the highlight of their stay. If the larger catchment is taken into account, the number of privately owned tourism facilities increases to at least 60 establishments.



Figure 5.h.1: On the northern boundary of the Namib Sand Sea within the buffer area, the Gobabeb Training and Research Centre hosts numerous scientists and students who study various aspects of the dunescape (Gobabeb Centre)

Other concession holders (see Table 4.a.3) conduct adventure tours elsewhere in the sand sea. During such tours the operators establish temporary flycamps and remove all waste from the area. A concession has been granted to establish a lodge at Meob Bay within the Property. Permission to construct a lodge has not yet been granted, however, pending an EIA and EMP. Day visits are allowed for self-drive 4x4 vehicles to Sandwich Harbour from Walvis Bay via a sand track. It ends at a demarcated area at Sandwich Harbour but there are no facilities of any kind.

5.i POLICIES AND PROGRAMMES RELATED TO THE PRESENTATION AND PROMOTION OF THE PROPERTY

Policies related to presentation and promotion of the Property are integrated into those used by the Ministry of Environment and Tourism (MET), the Namibian Wildlife Resorts (NWR) and the Namibian Tourism Board (NTB) throughout Namibia. The Gobabeb Training and Research Centre regularly compiles and distributes books, posters and booklets that describe aspects of the Namib Sand Sea. Well developed tourist information centres at Walvis Bay and Swakopmund provide substantial information about various aspects relating to the Namib Sand Sea. The Management Plan makes provision for specific activities to present the values and attributes for which the Namib Sand Sea is nominated (Table 5.i.1).



Table 5.i.1: Envisaged activities to promote the Namib Sand Sea

Activity	Co-ordination	Purpose
Develop and open information center at Sesriem with duplication of information products to other tourist information centers	MET Department of Tourism/National Committee for World Heritage	Dissemination of information on values for which the Namib Sand Sea is nominated
Develop information boards, concise tourist information and improved signage for key destinations	MET Chief Warden/National Committee for World Heritage	Site-specific information about key attributes
Develop information handbook and training syllabus for tour guides	Gobabeb Centre/Namibian Academy for Tourism and Hospitality	Informed tour guides that can provide better information to visitors
Summarise world heritage values of geology, ecology, biodiversity and key species into information booklet for schools and education centres nationwide	Gobabeb Centre/National Committee for World Heritage	National appreciation of the values for which the Namib Sand Sea was nominated
Identification of the kind and numbers of world heritage signage required for installation	MET Chief Warden/Roads Authority	Appropriate marketing of prospective World Heritage status
Develop visitor survey tools to record visitor perceptions, understanding and appreciation of the Namib Sand Sea	National Museum/Gobabeb Centre	Assessment of visitor experience
Develop an appropriate international marketing strategy	Namibia Tourism Board/Hospitality Association of Namibia	Specific marketing of the Namib Sand Sea as a prime tourist destination

Programmes related to the presentation and promotion of the Property are diverse. The MET, NWR and NTB take advantage of various tourism fairs globally where the Property is promoted alongside other premier Namibian attractions such as the Etosha National Park and the Fish River Canyon. The Property features regularly in the AirNamibia in-flight magazine, Flamingo, and unique aerial photos of the Property have graced the cover almost every month for the past several years.

All the 60 lodges situated in the vicinity of Sesriem and surrounding the Namib-Naukluft Park promote the Property as one of the main attractions of a stay at their establishments. This is echoed by the accommodation found in the surrounding towns of Walvis Bay and Lüderitz and throughout Namibia. Travel guides to Namibia or the southern African region invariably have a stunning picture of the Property on their front or back cover. Indirect promotion of the Property results from the use of images of this iconic landscape on advertising ranging from heavy transport, to IT, to food products, to sanitation codes of practice and to insurance companies. The Property is extremely well known and recognised both within Namibia and globally.

Promotion of the geography and natural history of the Property is found in a variety of well-illustrated books and pamphlets on sale throughout Namibia and elsewhere. Materials from these books and other publications have been integrated into the knowledge base focused on arid lands, which is accessible throughout the globe.

Films by National Geographic, BBC, Anglia and lesser-known companies have promoted the unique scenery, geomorphology and biota of the Property. At least 1 – 2 films are made every year with support of the Gobabeb Training and Research Centre and other, product-promotional films are made in other parts of the Property at a rate of 2 –3 per month.

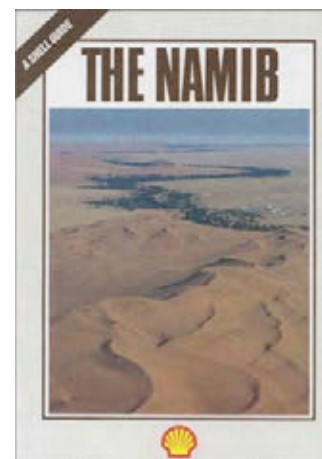


Figure 5.i.1: The iconic Namib Sand Sea is promoted in myriad ways (Gobabeb Centre)

5.j STAFFING LEVELS (PROFESSIONAL, TECHNICAL, MAINTENANCE)

The approved structure of the MET makes provision for 28 staff that are directly focused on the Namib Sand Sea as part of their responsibilities within the Directorate of Regional Services and Parks Management. These include: Deputy Director (1), Chief Control Warden (1), Chief Warden (1), Warden (2), Rangers (3), Operator/ Driver (2), Scouts (8), Watchman (6) and Workhand (4). This staff is supported by additional regional and national staff of the MET based in the capital and surrounding coastal towns. These include specialists from the Directorate of Scientific Services, the Department of Tourism and the Department of Environmental Affairs. All these Departments support activities as part of their overall mandate.

Staff members directly responsible for the Namib Sand Sea area of the Namib-Naukluft Park are based at Sesriem and Escourt with additional staff at Zeis and Ganab in the park. Other offices of MET are located in Walvis Bay, Swakopmund, Lüderitz and Windhoek although their staff members are not directly responsible for the Namib Sand Sea area. The approved structure of MET provides positions for three conservation scientists for the Namib-Naukluft Park area.

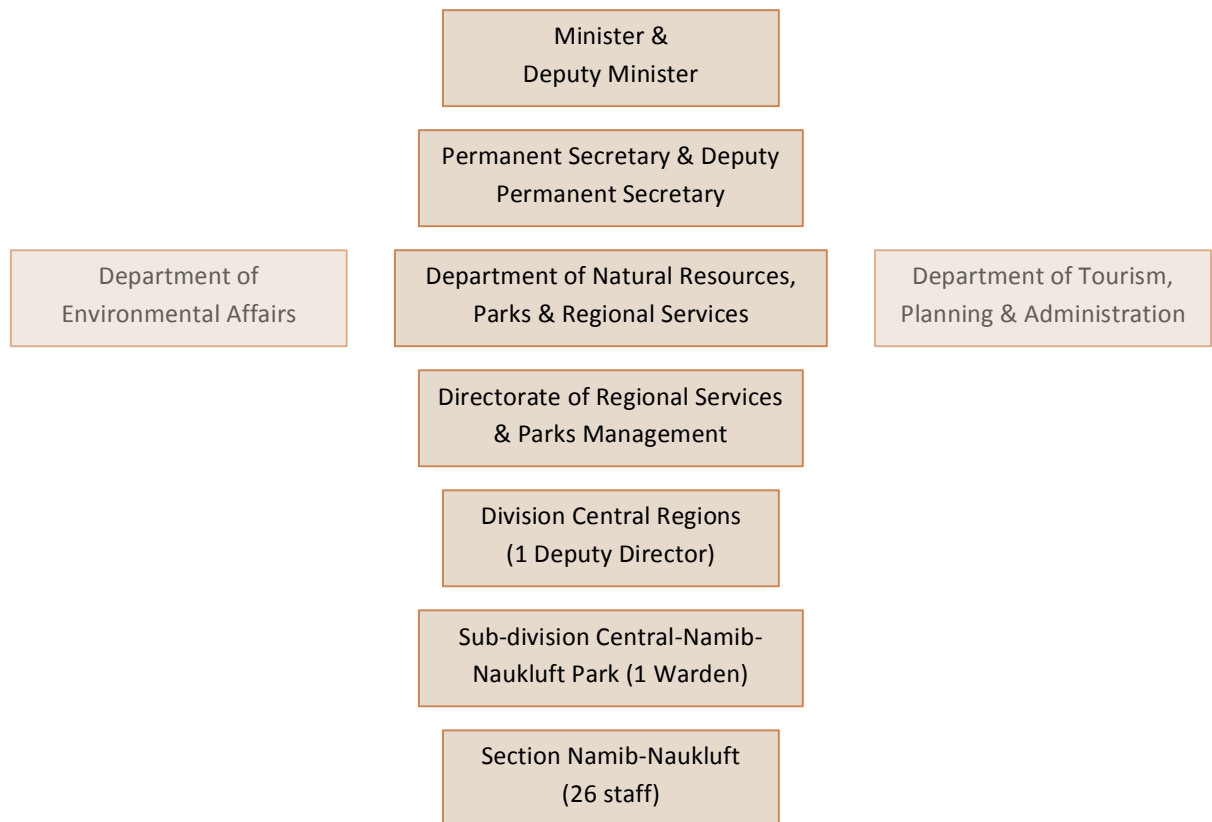


Figure 5.j.1: Staff responsible for the Namib Sand Sea overall

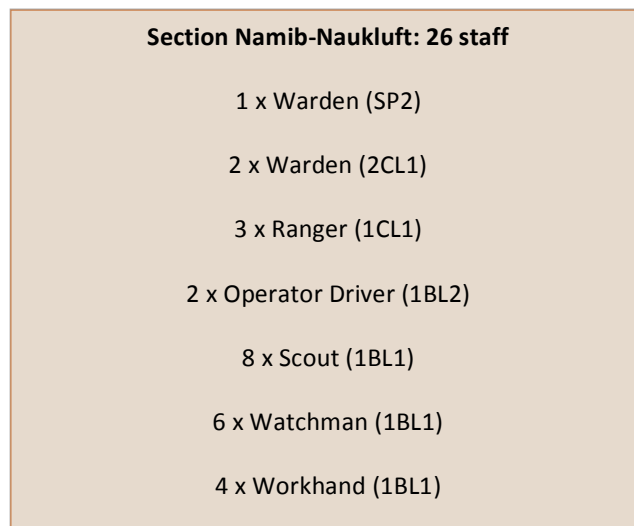


Figure 5.j.2: Staff directly responsible for the Namib Sand Sea

Research staff, interns and technicians numbering approximately 15, augmented by visiting scientists and tertiary institution interns, are resident at the Gobabeb Training and Research Centre situated on the northern boundary of the Property.





Monitoring



A light blanket of fog covers the coastal Namib Sand Sea (Paul van Schalkwyk)

6

Monitoring

Monitoring of the property is a long-term process focused on some locations but is not widespread. For at least the last century, the climate, primarily rainfall, evaporation, wind, temperature and humidity has been monitored in the two coastal towns closest to the property, Walvis Bay and Lüderitz. Since 1962 the Gobabeb Centre has been recording these same parameters as well as fog, soil temperatures and incidence of solar radiation. For the past decade, climate measurements have been made on NamibRand Nature Reserve bordering the property to the east. Data from numerous rainfall gauges at Sesriem and on farms bordering the eastern boundary have not been collated.

The MET has been monitoring migratory birds at the Sandwich Harbour Ramsar Site since the 1970s, more recently supported by the Coastal Environmental Trust of Namibia (an NGO). Breeding of vultures, particularly *Torgos tracheliotus*, has been monitored by MET and is pursued by the Vulture Study Group – Vultures Namibia (an NGO) along the larger ephemeral rivers in the east. Monitoring of vultures and other birds of prey also takes place in NamibRand Nature Reserve and other farms along the eastern boundary of the property.



Figure 6.1: Monitoring fauna is both an important process and a learning opportunity (Gobabeb Centre)

Vegetation and invertebrates have been the focus of research at the Gobabeb Centre and long-term monitoring has been conducted since the mid-1970s in the northern part of the Namib Sand Sea. Additional studies have been carried out by MET researchers and national agencies, such as the National Botanical Research Institute, which includes the National Herbarium, and the National Museum. Much of this information has been published in peer-reviewed literature or as research reports that are available in the Gobabeb library.



Figure 6.2: Population dynamics of assorted invertebrates, mammals and birds are part of the monitoring process (Gobabeb Centre)

To enhance monitoring throughout the property by various contributors in various places, accurate baseline maps of roads, infrastructure, historical, archaeological and palaeontological sites should be available and shared. A comprehensive meta-database and an overall research database would also support monitoring of the property. The need for such information has been mooted but not put in place. Elements of a meta-database, and extensive data records, are available at the Gobabeb Centre.

Processing of data to inform management planning and decision

making has been sporadic and uncoordinated. The management plan includes elements to improve the situation. Extensive information about the Namib-Naukluft Park including the Namib Sand Sea was compiled by the Gobabeb Centre and made available to the MET in preparation for their formulation of the 2003 Management Plan. Several Environmental Updates prepared by the Desert Research Foundation of Namibia for Parliament have touched on elements of the Namib Sand Sea, and more could be compiled in the future.

Information about birds of prey and vultures is processed by the Vulture Group and made available to the MET. The MET itself has been assembling data but, with the exception of bird counts at Sandwich Harbour, most has not been processed. Information on tourist numbers has been compiled by MET and made available to the Namibia Tourism Board (NTB). This will in future be coordinated by the Gobabeb Centre for more comprehensive information about activities in the Namib Sand Sea.

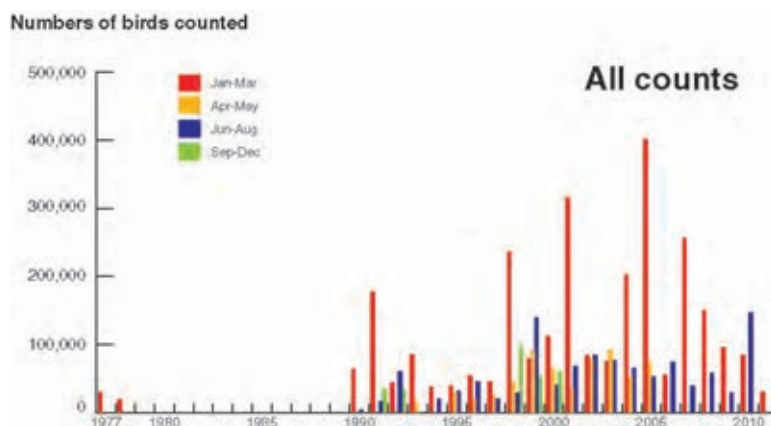


Figure 6.3: Results of monitoring bird numbers at Sandwich Harbour are just one of many monitoring processes in the Namib Sand Sea (Kolberg)

6.a KEY INDICATORS FOR MEASURING STATE OF CONSERVATION

The Management Plan indicates a series of management targets for the Namib Sand Sea. Indicators for measuring management of the state of conservation in the property are included (Table 6.a.1).

Ongoing monitoring of the Namib Sand Sea has been limited, focused mainly on aspects of weather, climate, birds, large mammals, invertebrates and vegetation. The majority of longer-term monitoring has taken place in the northern part of the Namib Sand Sea undertaken by the Gobabeb Training and Research Centre. The MET has focused intermittent, long-term monitoring on birds and large mammals. The Ministry of Fisheries and Marine Resources (MFMR) maintains a number of automatic weather stations on the coast and on the off-shore islands that provide valuable supporting data for the Namib Sand Sea. The Coastal Environmental Trust of Namibia (CETN) coordinates summer and winter bird counts of the Walvis Bay Lagoon and Sandwich Harbour in collaboration with MET. Also of value to measuring the state of conservation is the research and monitoring being conducted by NamibRand directly bordering the south-eastern boundary of the proposed property.

Table 6.a.1: Proposed indicators for monitoring state of conservation of the Namib Sand Sea

Indicator	Periodicity	Responsible	Location of records
Management indicators			
Planning, management and monitoring framework updated	5 year intervals	Chief Control Warden	Office: Chief Control Warden; Gobabeb Centre
Detailed tourism plan updated	5 year intervals	Director of Tourism	Office: Director of Tourism; Office Chief Control Warden; Gobabeb Centre
Strategic Forum annual meetings (MET, Gobabeb, neighbours)	Annual review	Chief Control Warden	Office: Chief Control Warden; Gobabeb Centre
Consultative Forum of interested parties for ongoing operational assistance, guidance, support and feedback	Annual review, quarterly meetings	Chief Control Warden	Office: Chief Control Warden; Gobabeb Centre
Honourary warden programme	Annual review	Chief Control Warden	Office: Chief Control Warden; Gobabeb Centre
Community interest group activities, e.g. birds of prey	Annual review	Individual interest groups (MET review)	Office: Chief Control Warden; Gobabeb Centre
Human use indicators			
Daily detailed tourism records (numbers, types of activities)	Monthly submission; annual review	Sesriem gate; Chief Warden	Office: Chief Warden; Office: Director of Tourism; Gobabeb Centre; Sesriem Gate



Ongoing detailed concession allocations and use (numbers, types of activities)	Annual review	Chief Warden	Office: Chief Warden; Office: Director of Tourism; Gobabeb Centre
Water use and management (tourism & wildlife)	Annual review	Chief Warden	Office: Chief Warden; Gobabeb Centre
Records of research activities and results	Annual review	Chief Warden; compiled by Gobabeb Centre	Office: Chief Warden; Gobabeb Centre
<i>Geographical indicators</i>			
Salt pans/flats; Endorheic pans (sensitivity 5 areas)	Annually	Chief Warden; Gobabeb Centre	Office: Chief Warden; Gobabeb Centre
Ephemeral rivers, inselbergs, gravel plains, rocky shore (sensitivity 4 areas)	Two year intervals	Chief Warden; Gobabeb Centre	Office: Chief Warden; Gobabeb Centre
Sand sea, Sandwich Harbour lagoon, eastern hills (sensitivity 3 areas)	Five year intervals	Chief Warden; Gobabeb Centre	Office: Chief Warden; Gobabeb Centre
Landscape aesthetics	Two year intervals	Chief Warden; Gobabeb Centre	Office: Chief Warden; Gobabeb Centre
Archaeological and palaeontological sites	Two year intervals	Chief Warden; Gobabeb Centre	Office: Chief Warden; Gobabeb Centre
Daily weather and climate; Sesriem, Coast (MFMR), Gobabeb	Daily; monthly submissions; annual review	Sesriem Gate; MFMR; Gobabeb Centre; Review: Chief Warden; Gobabeb Centre	Office: Chief Warden; Sesriem Gate; Gobabeb Centre
Hydrology and flooding as occur	Intermittent observations	Sesriem Gate; Gobabeb Centre; Review: Chief Warden; Gobabeb Centre	Office: Chief Warden; Sesriem Gate; Gobabeb Centre
<i>Ecological indicators</i>			
Annual and perennial vegetation population dynamics	Annually	Gobabeb Centre with PoN for remote sensing	Office: Chief Warden; Gobabeb Centre
Invertebrate population dynamics, ongoing measurements	Annual review	Gobabeb Centre	Office: Chief Warden; Gobabeb Centre
Breeding birds of prey/vultures	Twice annual review	Vulture Group; Chief Warden; Gobabeb Centre	Office: Chief Warden; Gobabeb Centre
Coastal migratory birds	Twice annually	CETN; Chief Warden; Gobabeb Centre	Office: Chief Warden; Gobabeb Centre
Large mammal populations	Annually/5 year intervals	Chief Warden; Gobabeb Centre	Office: Chief Warden; Gobabeb Centre
Invasive aliens	Annually	Chief Warden; Gobabeb Centre	Office: Chief Warden; Gobabeb Centre



To address their responsibilities for monitoring the state of conservation in the Namib Sand Sea, the Chief Control Warden responsible for the property intends to establish the 'event book' system used widely in communal conservancies and elsewhere in Namibia. This entails all staff members having an event book wherein they fill in observations of note, e.g. the flow of the Tsauchab river for the first time in five years, the eruption of a locust swarm, an ostrich nest. The entries include the event but also supporting information such as time, date, location and relevant surrounding circumstances. This is in addition to ongoing monitoring of key parameters.



Figure 6.a.1: The alien *Datura stramonium* is an indicator of disturbed ground (Gobabeb Centre)

The Gobabeb Training and Research Centre is well situated for overseeing and managing monitoring, research and data management with an extensive library, database and metadata base covering particularly climate, invertebrate and vegetation parameters. The Gobabeb Centre has been identified as the monitoring and research centre for the combined Namib-Skeleton Coast National Park network. It is currently gearing up to serve as the monitoring, research and data management centre on behalf of the Strategic Environmental Management Plan of the Ministry of Mines and Energy regarding the uranium rush taking place on the gravel plains well north of the Namib Sand Sea.

Reference areas for monitoring have not yet been established within the identified property. Two types of reference areas are envisaged. One would consist of areas that are known to be completely out of reach of any tourism or research activity within the Namib Sand Sea as

baseline monitoring sites. The other type of reference area would be established where concession holders guide tourists in the Namib Sand Sea. These latter reference areas would help to establish and interpret the unknown influences of adventure tourism, thought but not established to be of low impact, on the property.

6.b ADMINISTRATIVE ARRANGEMENTS FOR MONITORING PROPERTY

Since the MET is the owner of the identified property, they would be expected to hold overall responsibility for monitoring the property. It is anticipated that they will outsource components of this responsibility to the Gobabeb Training and Research Centre who would be accountable to the MET.

A key advantage of outsourcing this responsibility to the Gobabeb Centre is the possibility to integrate short-term research projects and observations, made by many visiting local and international scientists, into the longer-term measurements and scenarios generated from different locations with a variety of subjects and organisms.

6.c RESULTS OF PREVIOUS REPORTING EXERCISES

Reporting exercises that have addressed the Namib Sand Sea have mostly focused on localised areas and specific elements of the biophysical and socio-economic environment with the exception of a few international studies that specifically considered future priorities for World Heritage (Table 6.c.1). Various State of the Environment Reports, while not focusing on the Namib Sand Sea, will contribute background for an overall monitoring framework for the Namib Sand Sea. Refer to the bibliography attached as Annex 21.

Table 6.c.1: Previous reports relevant to the Namib Sand Sea

Year	Type of Report	Scope
2011	IUCN. World Heritage Desert Landscapes.	Global
2011	Ministry of Environment & Tourism. Tourist Statistical Report 2010.	Tourists
2010	Ministry of Environment & Tourism. State of Protected Areas in Namibia. A review of Progress and Challenges.	Conservation
2010	Federation of Namibian Tourism Associations. Conservancy Based Tourism Enterprises (CBTEs) in Namibia and the Business of Tourism: A Private Sector Point of View.	Economic
2010	Gobabeb Centre. Namib: Secrets of a desert uncovered.	Regional
2008	Ministry of Mines and Energy. Geology of Namibia.	Geology
2008	Namibia Economic Policy Research Unit. Preliminary domestic tourism survey findings.	Economic
2008	Ministry of Environment & Tourism. Strategic Environmental Assessment (SEA) for the coastal areas of the Erongo and Kunene Regions.	Conservation
2006	World Travel and Tourism Council. Tourism Satellite Account for the Republic of Namibia: The Impact of Travel and Tourism on Jobs and the Economy.	Economic
2005	National Botanical Research Institute. A Red Data Book of	Flora



	Namibian plants.	
2005	National Botanical Research Institute. Tree Atlas of Namibia. Windhoek.	Flora
2004	DEA: MET National review of invasive alien species.	Aliens
2004	IUCN.The World Heritage List: Future priorities for a credible and complete list of natural and mixed sites.	Global
1998	Namibia Biodiversity Task Force. Biological Diversity in Namibia: a country Study.	Biodiversity

Most of these reports do not focus on the Namib Sand Sea specifically, though they contributed to determine the information needs and strategies for an overall monitoring framework. In the context of this nomination, the global studies undertaken by IUCN in support of a representative World Heritage list are particularly important. Two studies specifically referred to the Namib for its potential nomination (Goudie, A. & Seely, M. 2011. World Heritage Desert Landscapes. IUCN, 44 pp; WHC-04/28.COM/INF.13B. 2004. The World Heritage List: Future priorities for a credible and complete list of natural and mixed sites. IUCN, Gland. 21 pp.). A quote from the latter document refers: *“Habitat types that emerge from a review of this data set which may have potential for WH nomination include: ... Namib desert”* (WHC-04/28.COM/INF.13B, 2004, p. 9).

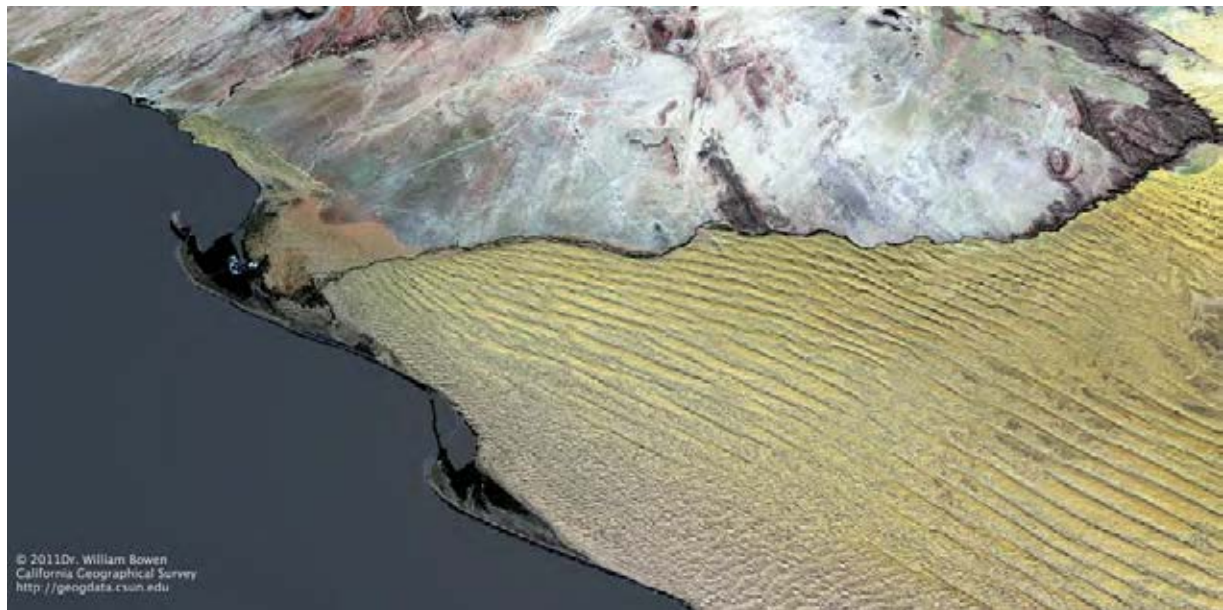


Figure 6.c.1: The northern boundary of the Namib Sand Sea terminates abruptly on the ephemeral Kueiseb River (Bowen/NASA)



7

Documentation





Black-backed jackel frequently patrol the Namib Sand Sea (Paul van Schalkwyk)

7

Documentation

7.a PHOTOGRAPHS, SLIDES, IMAGE INVENTORY AND AUTHORIZATION TABLE AND OTHER AUDIOVISUAL MATERIALS

Table 7.a.1: Photographs, slides, image inventory and authorization table and other audiovisual materials

ID No.	Format	Caption	Date of photograph ⁺	Photographer & Copyright owner	Contact details of copyright owner	Non-exclusion of rights [*]
NSS1	jpeg	Wind-controlled linear dune crests in the forever changing Namib Sand Sea	Un known	All images by Paul van Schalkwyk	All copyright by Paul van Schalkwyk PO Box 21593 Windhoek, Namibia tel: +264 81 277 3334 fax: +264 61 220 410 Email: elmarie@paulvans.com	yes
NSS2	jpeg	Diverse magnificent desert landforms populate the Namib Sand Sea	Un known			yes
NSS3	jpeg	A water-filled vlei on the eastern edge of the Namib Sand Sea	Un known			yes
NSS4	jpeg	The extreme aridity of the Namib Sand Sea is ameliorated by coastal fog and episodic rainfall events	Un known			yes
NSS5	jpeg	The iconic Dead Vlei with its 800-year old Acacia erioloba ghost forest near Sossus Vlei	Un known			yes
NSS6	jpeg	The deep blue of the South Atlantic juxtaposing the transverse dune crests of the Namib Sand Sea	Un known			yes
NSS7	jpeg	Southward view over the Namib Sand Sea from the Kuiseb River Canyon	Un known			yes



NNS8	jepg	The ephemeral Tsauchab River truncates the magnificent linear dunes of the Namib Sand Sea	Un known	All images by Paul van Schalkwyk	All copyright by Paul van Schalkwyk PO Box 21593 Windhoek, Namibia tel: +264 81 277 3334 fax: +264 61 220 410 Email: elmarie@paulvans.com	yes
NNS9	jepg	Bi-directional winds sculpture sinuous dune crests in the Namib Sand Sea	Un known			yes
NSS10	jepg	A light blanket of fog covers the coastal Namib Sand Sea	Un known			yes
NSS11	jepg	A striking display of the two Namib Sand Seas, with the Sossus Sand Formation superimposed on the Tsondab Sandstone Formation	Un known			yes
NSS12	jepg	Huge star dunes at Sossus Vlei dwarf the vegetation in the dry riverbed of the Tsauchab River	Un known			yes
NSS13	jepg	Ballooning – a tourism venture leaving only a light footprint in the Namib Sand Sea	Un known			yes
NSS14	jepg	The interplay of light and shadow on the dunes inspires the artistic soul in all of us	Un known			yes
NSS15	jepg	The aerial view does not do justice to the magnificent dunes at Sossus Vlei	Un known			yes
NSS16	jepg	Even after heavy rains, the ephemeral Tsauchab River is eventually swallowed by the Namib Sand Sea	Un known			yes
NSS17	jepg	Endless sand supply from the South Atlantic to the Namib Sand Sea at Sandwich Harbour	Un known			yes
NSS18	jepg	The Namib Sand Sea meets the southern Atlantic	Un known			yes
NSS19	Jep g	Endemic Damara terns and other birds at the Sandwich Harbour Ramsar Site in the Namib Sand Sea	Un known			yes

⁺ All photos taken between 2006 and 2008.

^{*} Acknowledgement requested when used.

7.b TEXTS RELATING TO PROTECTIVE DESIGNATION, COPIES OF PROPERTY MANAGEMENT PLANS OR DOCUMENTED MANAGEMENT SYSTEMS AND EXTRACTS OF OTHER PLANS RELEVANT TO THE PROPERTY

Texts relating to protective designation are attached as Annex 19. A copy of the main relevant property Management Plan is attached in Annex 20.

7.c FORM AND DATE OF MOST RECENT RECORDS OR INVENTORY OF PROPERTY

Information concerning the property is to be found in different locations. Information on management is in annual reports of the MET, and ancillary documentation, can be found in the library of the Directorate of Environmental Affairs, MET, and in the offices of the senior staff of MET, including the Chief Control Warden responsible for the Namib Sand Sea. The Management Plan makes provision for the review of which essential inventory information needs to be captured into a central database. More detailed information is included in Table 7.c.1

Table 7.c.1: Data inventories and archives relevant to the Namib Sand Sea

Type of Record	Depository were kept	Brief Description
Annual overview of management	MET Office: Chief Warden	Annual reports for MET and the Namib-Naukluft Park
Archaeological inventories	MYNSSC: National Museum of Namibia	Location and object data for recorded archaeological and national heritage material
Biological resource exploitation	MET Permit Office	Type and quantity of biological resources exploited under permit
Climate information	MWT: National Meteorological Institute; MFMR: National Marine Research & Information Centre; Gobabeb Training & Research Centre	Weather information from national recording stations; climate interpretation
Current management	MET Office: Chief Control Warden	All current files pertaining to management over the past 25 years, including planning, personnel, funding, concessions, reports
Ecological functioning	Gobabeb Training & Research Centre	Published and unpublished research results and interpretation



Environmental impact assessments	MET Office: Environmental Commissioner	All Environmental Impact Assessments directly and indirectly linked to the Namib Sand Sea
Geological inventories	MME: Geological Survey of Namibia	Geological maps, recorded mineral resources, geological exploration and research reports
Illegal activities	MET Office: Chief Control Warden	Type and frequency of law enforcement
Long-term ecological monitoring data	Gobabeb Training & Research Centre	Site-based data and analysis of long-term monitoring results
Management history	MYNSSC: National Archives of Namibia	Official management authority files older than 25 years
Mineral resource exploitation	MYNSSC: National Archives of Namibia; MME: Commissioner of Mines	Type and quantity of geological resources that have been exploited historically and more recently
National heritage	MYNSSC: National Heritage Council	Records, evaluations and reports on national heritage (including generic heritage, e.g. shipwrecks)
National infrastructure	MLR: Surveyor-General	Roads, property ownership, structures, aerial photography and topography
Paleontological inventories	MME: Geological Survey of Namibia	Location data for palaeontological sites and contents
Plant species inventories	MAWF: National Botanical Research Institute	Location data for recorded plant species
Population & household numbers	NPC: National Statistics Office	Decadal information on population numbers and household structures
Ramsar monitoring and reporting	MET Office: Chief Control Warden	Semi-annual migratory bird count information and Ramsar reports
Research activity	MET Permit Office	Applications and reports for all research activity in the Namib Sand Sea
Terrestrial animal species inventories	MYNSSC: National Museum of Namibia	Location data for recorded animal species
Visitor numbers	National Tourism Board; MET Office: Chief Control Warden	General information on tourism numbers (mainly foreign) and specific visitor numbers
Water and discharge information	MAWF: Department of Water Affairs	Water quality, geohydrology and surface hydrology information, flood information
Wildlife census information	MET Office: Wildlife Survey & Monitoring	Wildlife aerial and waterhole census data per species



7.d ADDRESS WHERE INVENTORY, RECORDS AND ARCHIVES ARE HELD

Ministry of Environment and Tourism
Private Bag 13346
Windhoek
Namibia

Gobabeb Training and Research Centre
P O Box 953
Walvis Bay
Namibia

National Archives
Private Bag 13250
Windhoek
Namibia

National Museum of Namibia
P O Box 1203
Windhoek
Namibia



7.e BIBLIOGRAPHY

An indicative bibliography of approximately 1,000 publications including information about the Namib Sand Sea and located within the comprehensive library of the Gobabeb Centre is attached as Annex 21.


Key references used in preparation of this nomination dossier are included here (Section 7.e).

Archaeology & History

- Alexander JE. 1838. An expedition of discovery into the interior of Africa. 2 Volumes. Facsimile reprint 1967. Cape Town: C. Struik.
- Budack K. 1977. The Aonin or Topnaar of the Lower !Kuiseb Valley and the Sea. *Khoisan Linguistic Studies* 3: 1-42.
- Kinahan, J.H. 1988. The Pillar in the Mist: a History of the Dias Padrao at Lüderitz. National Monuments Council, Windhoek, 509 pp.
- Kinahan JH. 1990. The impenetrable shield: HMS Nautilus and the Namib coast in the late eighteenth century. *Cimbebasia* 12: 23-61.
- Kinahan J. 1991. Pastoral Nomads of the Central Namib Desert: The people history forgot. Cape Town: Associate Printing, 167 pp.
- Kinahan JH. 1992. By Command of their Lordships. The exploration of the Namibian Coast by the Royal Navy, 1795-1895. Namibia Archaeological Trust, Windhoek, 216 pp.
- Kinahan JH. 2000. Cattle for beads: The archaeology of historical contact and trade on the Namib Coast. *Studies in African Archaeology* 17. Sweden: Uppsala University Press.
- Pickford M, Senut B. 1999. Geology and palaeobiology of the Namib Desert. *Mem. Geol. Surv. Namibia* 18, 155 pp.
- Sandelowsky BH. 1976. An ancient butchery site in the dunes of the Namib. *South West African Annual*, Windhoek: 117-120.
- Schneider GIC. 2009. Treasures of the Diamond Coast. MacMillan Education Namibia, Windhoek, 320 pp.
- Ségalen L, Renard M, Pickford M, Senut B, Cojan I, Le Callonec L, Rognon P. 2002. Environmental and climatic evolution of the Namib Desert since the Middle Miocene: the contribution of carbon isotope ratios in ratite eggshells. *Comptes Rendus Geoscience* 334: 917-924.
- Shackley ML. 1980. An Achaulean site with *Elephas recki* fauna from Namib IV, South West Africa/Namibia. *Nature* 284.340-1.
- Shackley ML. 1985. Paleolithic archaeology of the Central Namib Desert: A preliminary survey of chronology, typology and site location. *Cimbebasia Memoir* 6. Windhoek: State Museum, 1-84.
- Vigne R. 2000. The hard road to colonization: The Topnaar Aonin of Namibia, 1670-1878. *Journal of Colonialism and Colonial History* 1-2.
- Vogel JC. 1989. Evidence of past climatic change in the Namib Desert. *Palaeogeography, Palaeoclimatology, Palaeoecology* 70: 355-366.

Biodiversity

- Barnard P. (ed.) 1998. Biological Diversity in Namibia: a country Study. Namibia Biodiversity Task Force. MET, Windhoek. 332 pp.
- Bethune S, Griffin M, Joubert D. 2004. National review of invasive alien species: Namibia. DEA: MET, Windhoek. 153 pp.
- Cloudsley-Thompson JL. 2001. Ecological analogues and convergence among desert organisms. *Biogeographica* 77: 51-63.


- 
- Crawford CS, Seely MK. 1987. Assemblages of surface-active arthropods in the Namib dunefield and associated habitats. *Revue de Zoologie Africaine* 101: 397-421.
- Crawford CS. 1986. The role of invertebrates in desert ecosystems. In: *Pattern and process in desert ecosystems*, Whitford WG. (ed.) University of New Mexico Press, Albuquerque: 73-91.
- Harrison JDuG, Scholtz CH, Chown SL. 2010. A revision of the endemic south-western African dung beetle subgenus *Scarabaeus* (*Pachysoma*) MacLeay, including notes on other flightless Scarabaeini (Scarabaeidae: Scarabaeinae). *Journal of Natural History* 37: 305-355.
- Heatwole H. 2001. Realized ant assemblages in the Namib, Kalahari and Kara-kum deserts. In: *Ecology of desert environments*. Prakash I. (ed) Scientific Publishers, (Jodhpur India): 301-332.
- Koch C. 1960. The tenebrionid beetles of South West Africa. *South African Museums Association Bulletin* 7: 73-85.
- Koch C. 1962. The Tenebrionidae of Southern Africa. 31: Comprehensive notes on the tenebrionid fauna of the Namib Desert. *Annals of the Transvaal Museum, Pretoria* 24: 61-106.
- Loots, S. 2005. A Red Data Book of Namibian plants. *SABONET Report No. 38*. 124 pp.
- Mannheimer C, Jacobson K. 1998. Fungal diversity in Namibia. In: *Biological Diversity in Namibia - a country study*, Barnard P. (ed.) Namibian National Biodiversity Task Force, Windhoek: 110-113.
- Scholtz CH, Harrison JDG, Grebennikov VV. (2004). Dung beetle (*Scarabaeus* (*Pachysoma*)) biology and immature stages: reversal to ancestral states under desert conditions (Coleoptera: Scarabaeidae). *Biological Journal of the Linnean Society*, 83: 453-460.
- Simmons LW, Ridsdill-Smith TJ. 2011. Ecology and Evolution of Dung Beetles. John Wiley, Chichester.
- Steckel J, Penrith ML, Henschel J, Brandl R, Meyer J. 2010. A preliminary molecular phylogeny of the Namib Desert darkling beetles (Tenebrionidae). *African Zoology* 45: 107-114.
- Wharton RA. 1981. Namibian Solifugae (Arachnida). *Cimbebasia Memoir*: 1-87.

Climate and Weather

- Cermak J. 2011. Low clouds and fog along the South-Western African coast – Satellite-based retrieval and spatial patterns. *Atmospheric Research*. Doi:10.1016/j.atmosres. 2011.02.012.
- Eckardt FD, Schemenauer RS. 1998. Fog water chemistry in the Namib Desert, Namibia. *Atmospheric Environment* 32: 2595-2599.
- Eltayeb MAH, Van Grieken RE, Maenhaut W, Annegarn HJ. 1993. Aerosol-soil fractionation for Namib Desert samples. *Atmospheric Environment* 27A: 669-678.
- Henschel J, Mtuleni V, Gruntkowski N, Seely M, Shanyengana SE. 1998. NAMFOG: Namibian application of fog-collecting systems. *Occasional paper no. 8*, DRFN: 82 pp.
- Kaseke KF. 2009. "Non rainfall" atmospheric water in arid soil micro-hydrology and ecology. MSc. University of Stellenbosch. Stellenbosch: 184 pp.
- Lancaster J, Lancaster N, Seely MK. 1984. Climate of the central Namib Desert. *Madoqua* 14: 5-61.
- Pietruszka RD, Seely MK. 1985. Predictability of two moisture sources in the Namib Desert. *South African Journal of Science* 81: 682-685.
- Sharon D. 1981. The distribution in space of local rainfall in the Namib Desert. *Journal of Climatology* 1: 69-75.
- Soderberg KS. 2010. *The role of fog in the ecohydrology and biogeochemistry of the Namib Desert*. PhD. Department of Environmental Sciences, University of Virginia: 200 pp.
- Taljaard JJ. 1979. Low-level atmospheric circulation over the Namib. *Newsletter (South Africa. Weather Bureau)*. Weather Bureau Department of Transport. Pretoria: 65-67.


Ecology

- Dawson WR, Pinshow B, Bartholomew GA, Seely MK, Shkolnik A, Shoemaker VH, Teeri JA. 1989. What's special about the physiological ecology of desert organisms? *Journal of Arid Environments* 17: 131-143.

- 
- Eichler H. 1990. Von Wasser und Wind in der zentralen Namib (Namibia) - Bemerkungen zum wenig beachteten Feuchtehaushalt in den Dünensanden einer Nebelwüste. *Mainzer Geographische Studien* 34: 61-76.
- Hamilton WJ III. 1973. *Life's color code*. McGraw-Hill Book Company, New York: 238 pp.
- Henschel JR, Robertson MB, Seely MK. 2001. Animal ecophysiology in the Namib Desert: coping with little water, scarce food and elevated temperatures. In: *Ecology of desert environments*. Prakash I. (ed) Scientific Publishers, Jodhpur, India: 423-457 pp.
- Jacobson KM, Jacobson PJ. 1998. Rainfall regulates decomposition of buried cellulose in the Namib Desert. *Journal of Arid Environments* 38: 571-583.
- Jürgens N, Burke A, Seely MK, Jacobson KM. 1997. Desert. In: *Vegetation of Southern Africa*, Cowling RM, Richardson DM, Pierce SM. (eds) Cambridge University Press: 189-214.
- Koch C. 1961. Some aspects of abundant life in the vegetationless sand of the Namib Desert dunes. *Journal S.W.A. Scientific Society* 15: 9-34.
- Koch C. 1962. Zur Ökologie der Dünen-Tenebrioniden der Namibwüste Südwest-Afrikas und Angolas. *Lunds Universitets Arsskrift N.F.* 58: 3-25.
- Kühnelt W. 1963. Die ökologischen Verhältnisse der Namib-Wüste (Südwestafrika). *Proceedings: Comunicacion al Coloquio "Aportacion de las Investigaciones Ecologicas y Agricolas a la lucha del mundo contra el hambre"*. Madrid, Spain: 1-20.
- Lawrence RF. 1959. The sand-dune fauna of the Namib Desert. *South African Journal of Science* 55: 233-239.
- Louw GN. 1972. The role of advective fog in the water economy of certain Namib Desert animals. *Proceedings: Comparative physiology of desert animals*. Maloiy GMO. (ed) Symposium of the Zoological Society, London: 297-314.
- Robinson MD, Seely MK. 1980. Physical and biotic environments of the southern Namib dune ecosystem. *Journal of Arid Environments* 3: 183-203.
- Seely MK. 1978. The Namib dune desert: an unusual ecosystem. *Journal of Arid Environments* 1: 117-128.
- Seely MK. 1991. Sand dune communities. In: *The ecology of desert communities*, Polis GA. (Editor) The University of Arizona Press, Tucson: 348-382.
- Seely MK, Louw GN. 1980. First approximation of the effects of rainfall on the ecology and energetics of a Namib Desert dune ecosystem. *Journal of Arid Environments* 3: 25-54.
- Seely MK, Mitchell D. 1987. Is the subsurface environment of the Namib Desert dunes a thermal haven for chthonic beetles? *South African Journal of Zoology* 22: 57-61.
- Shannon LV, Siegfried WR, Ward JD. 1989. Namib-Benguela interactions. *South African Journal of Science* 85: 277-279.
- Southgate RI, Masters P, Seely MK. 1996. Precipitation and biomass changes in the Namib Desert dune ecosystem. *Journal of Arid Environments* 33: 267-280.
- Walter H. 1986. The Namib Desert. In: *Ecosystems of the world 12B Hot Deserts and Arid Shrublands*. Evenary M, Noy-Meir I, Goodall DW. (eds) E. Elsevier, Amsterdam: 245-282.
- Ward JD, Corbett I. 1990. Towards an age for the Namib. In: *Namib ecology 25 years of Namib research*. Seely MK. (Editor) Transvaal Museum, Pretoria: 17-26.

Ephemeral rivers, water and hydrology

- Huntley BJ. 1985. (ed) *The Kuiseb environment: the development of a monitoring baseline*. Council for Scientific and Industrial Research, South African National Scientific Programmes, Pretoria: 138 pp.
- Jacobson PJ, Jacobson KM, Angermeier PL, Cherry DS. 2000. Variation in material transport and water chemistry along a large ephemeral river in the Namib Desert. *Freshwater Biology* 44: 481-491.
- Jacobson PJ, Jacobson KM, Seely MK. 1995. *Ephemeral rivers and their catchments. Sustaining people and development in western Namibia*. DRFN, Windhoek: 160 pp.


- 
- Lange J. 2005. Dynamics of transmission losses in a large arid stream channel. *Journal of Hydrology* 306: 112-126.
- Morin E, Grodek T, Dahan O, Benito G, Kulls C, Jacoby Y, van Langenhove G, Seely M, Enzel Y. 2009. Flood routing and alluvial aquifer recharge along the ephemeral arid Kuiseb River, Namibia. *Journal of Hydrology* 368: 262-275.
- Schachtschneider K, February EC. 2010. The relationship between fog, floods, groundwater and tree growth along the lower Kuiseb River in the hyperarid Namib. *Journal of Arid Environments* 74: 1632-1637.
- Yamagata K. 2010. Recent grain-size coarsening of floodplain deposits and forest decline along the Kuiseb River, Namib Desert, Namibia. *African Study Monographs Supplement*: 19-30

General

- Louw G, Seely M. 1982. *Ecology of desert organisms*. Longman, London and New York. 194 pp.
- Lovegrove B. 1993. *The living deserts of southern Africa*. Fernwood Press, Cape Town. 224 pp.
- Mendelsohn, J. Jarvis, A. Roberts, C. and Robertson, T. 2002. Atlas of Namibia. David Philip, Cape Town.
- MET. 2010. *The Economic Value of Namibia's Protected Area System: A Case for Increased Investment*. February 2010. MET, Directorate of Parks & Wildlife Management. Windhoek.
- MET. 2010. State of Protected Areas in Namibia. A review of Progress and Challenges. Ministry of Environment & Tourism, Windhoek. 177 pp.
- NACOMA. 2010. *Strategic Environmental Assessment (SEA) for the Coastal areas of Namibia – Combined Report*.
- Polis GA. 1991. (ed) *Ecology of desert communities*. University of Arizona Press, Tucson: 456 pp.
- Seely MK. 1987. *The Namib - Natural history of an ancient desert*. DRFN, Namibia: 104 pp.
- Seely MK. 1990. (ed) *Namib ecology*. Transvaal Museum Monograph 7, Pretoria: 230 pp.
- Seely M. (ed) 1994. *Deserts. The illustrated library of the earth*. Weldon Owen Pty Limited, McMahons Point, Australia: 160 pp.
- Seely M, Pallett J. 2008. *Namib - Secrets of a desert uncovered*. Venture Publ., Windhoek: 202 pp.
- Wallace, M. 2011. The history of Namibia. Jacana, Pretoria.

Geomorphology

- Besler H. 1972. *Klimaverhältnisse und klimageomorphologische Zonierung der zentralen Namib (Südwestafrika)*. *Stuttgarter Geographische Studien Volume 83*: 209 pp.
- Besler H. 1980. *Die Dünen-Namib: Entstehung und Dynamik eines Ergs*. *Stuttgarter Geographische Studien Volume 96*: 208 pp.
- Besler H, Gut S. 1997. Untersuchungen zum Feuchtehaushalt in Dünen am Beispiel der Namib/Namibia. *Kölner Geographische Arbeiten Sonderfolge Afrika* 13: 39-47.
- Bluck BJ, Ward JD, Cartwright J, Swart R. 2007. The Orange River, southern Africa: an extreme example of a wave-dominated sediment dispersal system in the South Atlantic Ocean. *J. geol. Soc. London* 164, 341-351.
- Bourke MC, Viles HA. 2007. *A Photographic Atlas of Rock Breakdown Features in Geomorphic Environments*. Tucson: Planetary Science Institute.
- Bristow CS, Duller GAT, Lancaster J. 2007. Age and dynamics of linear dunes in the Namib Desert. *Geology* 35: 555-558.
- Deacon J, Lancaster N. 1988. *Late Quaternary palaeoenvironments of southern Africa*. Clarendon Press. Oxford: 2-225.
- Eckardt FD, Washington R, Wilkinson MJ. 2001. The origin of dust on the West Coast of Southern Africa. In: *Palaeoecology of Africa and the surrounding islands*. Heine C. (ed). AA Balkema, Lisse, The Netherlands: 207-219.


- 
- Goudie AS, Eckardt FD. 1999. The evolution of the morphological framework of the central Namib Desert, Namibia, since the early Cretaceous. *Geografiska Annaler* 81A: 443-458.
- Heine K. 1998. Late Quaternary climate changes in the Central Namib Desert, Namibia. In: Quaternary Deserts and Climatic Change. Alsharhan AS, Glennie KW, Whittle GL, Kendall CGStC. (eds) *Proceedings of the International Conference on Quaternary Deserts and Climatic Change*. AA Balkema, Rotterdam: 293-304.
- Hövermann J. 1988. The Sahara, Kalahari and Namib Deserts: a geomorphological comparison. *Symposium on geomorphology of Southern Africa*. Geomorphological Society, Umtata: 71-83.
- Kocurek G, Lancaster N, Carr M, Frank A. 1999. Tertiary Tsondab Sandstone: preliminary bedform reconstruction and comparison to modern Namib Sand Sea dunes. *Journal of African Earth Sciences* 29, 629-42.
- Lancaster N. 1989. *The Namib sand sea. Dune forms, processes and sediments*. AA Balkema, Rotterdam: 180 pp.
- Lancaster N. 1995. *Geomorphology of desert dunes*. Routledge Physical Environment Series. Volume 9. Richards K. (Editor) Routledge, London & New York: 290 pp.
- Livingstone I, Bristow C, Bryant RG, Bullard J, White K, Wiggs GFS, Baas ACW, Bateman MD, Thomas DSG. 2010. The Namib Sand Sea digital database of aeolian dunes and key forcing variables. *Aeolian Research* 2: 93-104.
- McKee ED. 1982. Sedimentary structures in dunes of the Namib Desert, South West Africa. *The Geological Society of America Special paper*: 1-64.
- Miller RMcG. 2008. *The Geology of Namibia*. Vols. 1 -3, Geological Survey of Namibia.
- Vermeesch P, Fenton CR, Kober F, Wiggs GFS, Bristow CS, Xu S. 2010. Sand residence times of one million years in the Namib Sand Sea from cosmogenic nuclides. *Nature Geoscience*: 1-4.
- Viles H. 2005. Microclimate and weathering in the central Namib Desert, Namibia. *Geomorphology* 67: 189-209.
- Viles H, Goudie A. 2000. Weathering, geomorphology and climatic variability in the Central Namib Desert. In: *Linking climate change to land surface change*. McLaren SJ, Kniveton DR. (eds) Kluwer, Dordrecht: 65-82.
- Walden J, White K. 1997. Investigation of the controls on dune colour in the Namib Sand Sea using mineral magnetic analyses. *Earth and Planetary Science Letters* 152: 187-201.

Invertebrate behaviour, physiology and ecology

- Bartholomew GA, Lighton JRB, Louw GN. 1985. Energetics of locomotion and patterns of respiration in tenebrionid beetles from the Namib Desert. *Journal of Comparative Physiology, B* 155: 155-162.
- Brownell P, Polis G (eds). 2001. *Scorpion biology and research*. Oxford University Press: 431 pp.
- Cooper PD. 1982. Water balance and osmoregulation in a free-ranging tenebrionid beetle, *Onymacris unguicularis*, of the Namib Desert. *Journal of Insect Physiology* 28: 737-742.
- Coutchié PA, Crowe JH. 1979. Transport of water vapor by tenebrionid beetles I: kinetics. *Physiological Zoology* 52: 67-87.
- Crawford CS, Seely MK. 1994. Detritus mass loss in the Namib Desert dunefield: influence of termites, gerbils and exposure to surface conditions. *Journal of African Zoology* 108: 49-54.
- Crawford CS, Taylor EC. 1984. Decomposition in arid environments: role of the detritivore gut. *South African Journal of Science* 80: 170-176.
- Curtis BA, Seely MK. 1987. Effect of an environmental gradient upon the distribution and abundance of the dune ant, *Camponotus detritus*, in the central Namib Desert. *Journal of Arid Environments* 13: 259-266.
- Dallas HF, Curtis BA, Ward D. 1991. Water exchange, temperature tolerance, oxygen consumption and activity of the Namib Desert snail, *Trigonephrus* sp. *Journal of Molluscan Studies* 57: 359-366.
- De Villiers PS, Hanrahan SA. 1991. Sperm competition in the Namib Desert beetle, *Onymacris unguicularis*. *Journal of Insect Physiology* 37: 1-8.



- Hamilton WJ III, Seely MK. 1976. Fog basking by the Namib Desert beetle, *Onymacris unguicularis*. *Nature* 262: 284-285.
- Hanrahan SA, Kirchner WH. 1994. Acoustic orientation and communication in desert tenebrionid beetles in sand dunes. *Ethology* 97: 26-32.
- Henschel JR, Lubin YD. 1992. Environmental factors affecting the web and activity of a psammophilous spider in the Namib Desert. *Journal of Arid Environments* 22: 173-189.
- Henwood K. 1975. A field-tested thermoregulation model for two diurnal Namib Desert tenebrionid beetles. *Ecology* 56(6): 1329-1342.
- Holm E, Edney EB. 1973. Daily activity of Namib Desert arthropods in relation to climate. *Ecology* 54: 45-56.
- Louw GN, Nicolson SW, Seely MK. 1986. Respiration beneath desert sand: carbon dioxide diffusion and respiratory patterns in a tenebrionid beetle. *Journal of Experimental Biology* 120: 443-447.
- Lubin Y, Henschel J. 1996. The influence of food supply on foraging behaviour in a desert spider. *Oecologia* 105: 64-73.
- McClain E, Seely MK, Hadley NF, Gray V. 1985. Wax blooms in tenebrionid beetles of the Namib Desert: correlations with environment. *Ecology* 66: 112-119.
- Nicolson SW, Hanrahan SA. 1986. Diuresis in a desert beetle? hormonal control of the Malpighian tubules of *Onymacris plana* (Coleoptera: Tenebrionidae). *Journal of Comparative Physiology B* 156: 407-413.
- Norgaard T, Dacke M. 2010. Fog-basking behaviour and water collection efficiency in Namib Desert darkling beetles. *Frontiers in Zoology* 7: 1-8.
- Norgaard T, Nilsson D, Henschel JR, Garm A, Wehner R. 2008. Vision in the nocturnal wandering spider *Leuchorchestris arenicola* (Araneae: Sparassidae). *Journal of Experimental Biology* 211: 816-823.
- Polis GA, Barnes JD, Seely MK, Henschel JR, Enders MM. 1998. Predation as a major cost of reproduction in Namib Desert tenebrionid beetles. *Ecology* 79: 2560-2566.
- Rasmussen JL, Seely MK, Pietruszka RD. 1991. The reproductive behavior of six species of Namib Desert tenebrionid beetles (Coleoptera: Tenebrionidae). *Journal of Insect Behavior* 4: 567-582.
- Roberts CS, Seely MK, Ward D, Mitchell D, Campbell JD. 1991. Body temperatures of Namib Desert tenebrionid beetles. *Physiological Entomology* 16: 463-475.
- Roer H. 1986. Zur Anpassung des Schwarzkäfers *Onymacris unguicularis* (Haag) (Col.: Tenebrionidae, Adesmiini) an die Nebelzone der Namibwüste. *Bonner Zoologische Beiträge* 37: 143-154.
- Rössl R. 2005. Factors influencing egg laying behaviour and triggering ovulation in desert Tenebrionidae (Coleoptera: Insecta). *Mitteilungen der Deutschen Gesellschaft für angewandte Entomologie* P11-05: 1-3.
- Schulze L. 1966. The Tenebrionidae of southern Africa 39. A revised key to the larvae of *Onymacris Allard* (Coleoptera: Adesmiini). *Scientific Papers of the Namib Desert Research Station*: 1-7.
- Seely MK, Hamilton WJ.III. 1976. Fog catchment sand trenches constructed by tenebrionid beetles, *Lepidochora*, from the Namib Desert. *Science* 193: 484-486.
- Seely M, Henschel JR, Hamilton WJ III. 2005. Long-term data show behavioural fog collection adaptations determine Namib Desert beetle abundance. *South African Journal of Science* 101: 570-572.
- Turner JS, Lombard AT. 1990. Body colour and body temperature in white and black Namib desert beetles. *Journal of Arid Environments* 19: 303-315.
- Watson RT. 1989. Niche separation in Namib Desert dune Lepismatidae (Thysanura: Insecta): detritivores in an allochthonous detritus ecosystem. *Journal of Arid Environments* 17: 37-48.
- Wehner R. 1987. Spatial organization of foraging behavior in individually searching desert ants, *Cataglyphis* (Sahara Desert) and *Ocymyrmex* (Namib Desert). In: *Behavior in Social Insects*. Pasteels JM, Deneubourg J-L. (eds) Birkhäuser Verlag, Basel/Boston: 15-42.



Wharton RA. 1980. Colouration and diurnal activity patterns in some Namib Desert Zophosini (Coleoptera: Tenebrionidae). *Journal of Arid Environments* 3: 309-317.

Natural History

Hamilton WJ.III. 1983. The living sands of the Namib. *National Geographic*, Washington, D.C.: 364-377.

Seely MK, Zeidler J, Henschel JR, Barnard P. 2003. Creative problem solving in support of biodiversity conservation. *Journal of Arid Environments* 54(1): 155-164.

Van den Eynden V, Vernemmen P, Van Damme P. 1992. *The ethnobotany of the Topnaar*. Universiteit Gent, Gent. Belgium: 145 pp.

Tourism

Bridgeford P, Bridgeford M. 2009. *Touring Sesriem & Sossuvlei*. P. & M. Bridgeford. Namibia.

Directorate of Tourism, Ministry of Environment & Tourism. 2011. Tourist Statistical Report 2010. DoT MET, Windhoek, 53 pp.

SIAPAC. 2007. Study on characteristics of demand of tourists and use patterns of protected areas in Namibia. Ministry of Environment & Tourism, Windhoek. 154 pp.

World Travel and Tourism Council. 2006. Tourism Satellite Account for the Republic of Namibia: The Impact of Travel and Tourism on Jobs and the Economy. WTTC, London. 64 pp.

Vegetation physiology and ecology

Danin A. 1991. Plant adaptations in desert dunes. *Journal of Arid Environments* 21: 193-212.

Günster A. 1994. Seed bank dynamics - longevity, viability and predation of seeds of serotinous plants in the central Namib Desert. *Journal of Arid Environment* 28: 195-205.

Hachfeld B, Jürgens N. 2000. Climate patterns and their impact on the vegetation in a fog driven desert: the Central Namib Desert in Namibia. *Phytocoenologia* 30: 567-589.

Henschel J, Dausab R, Moser P, Pallett J. 2004. (eds). *!NARA fruit for development of the !Khuseb Topnaar*. Namibia Scientific Society, Windhoek: 168 pp.

Jacobson KM. 1997. Moisture and substrate stability determine VA-mycorrhizal fungal community distribution and structure in an arid grassland. *Journal of Arid Environments* 35: 59-75.

Louw GN, Seely MK. 1980. Exploitation of fog water by a perennial Namib dune grass, *Stipagrostis sabulicola*. *South African Journal of Science* 76: 38-39.

Moser PM. 2006. *Regeneration and utilization of Faidherbia albida and Acacia erioloba along ephemeral rivers of Namibia*. PhD. University of Bonn, Bonn: 122 pp.

Muller A. 2010. *The dynamics of seed bank dispersal and deposition under natural environmental conditions in the central Namib and the southern Kalahari Deserts*. MSc. The University of Namibia. Windhoek: 208 pp

Nott K. 1985. *An autecological study of a Namib dune succulent, Trianthema hereroensis*. MSc. University of Natal. Pietermaritzburg: 147 pp

Seely MK. 1990. Patterns of plant establishment on a linear desert dune. *Israel Journal of Botany* 39: 443-451.

Seely MK, de Vos MP, Louw GN. 1977. Fog imbibition, satellite fauna and unusual leaf structure in a Namib Desert dune plant *Trianthema hereroensis*. *South African Journal of Science* 73: 169-172.

Yeaton RI. 1988. Structure and function of the Namib dune grasslands: characteristics of the environmental gradients and species distributions. *Journal of Ecology* 76: 744-758.

Yeaton RI. 1990. The structure and function of the Namib dune grasslands: species interactions. *Journal of Arid Environments* 18: 343-350.



Vertebrate behaviour, physiology and ecology

- Boyer D. 1985. Interaction of two *Gerbillurus* species in the Namib. *South African Journal of Science* **81**: 704.
- Brain CK. 1962. Observations on the temperature tolerance of lizards in the central Namib Desert, South West Africa. *Cimbebasia* **4**: 1-5.
- Cox GW. 1983. Foraging behaviour of the dune lark. *The Ostrich* **54**: 113-120.
- Dempster ER, Perrin MR. 1989. A comparative study of agonistic behaviour in hairy-footed gerbils (genus *Gerbillurus*). *Ethology* **83**: 43-59.
- Downs CT, Perrin MR. 1989. An investigation of the macro- and micro-environments of four *Gerbillurus* species. *Cimbebasia* **11**: 41-54.
- Fielden LJ. 1991. Home range and movements of the Namib desert golden mole, *Eremitalpa granti namibensis* (Chrysochloridae). *Journal of Zoology, London* **223**: 675-686.
- Fielden LJ, Waggoner JP, Perrin MR, Hickman GC. 1990. Thermoregulation in the Namib Desert golden mole, *Eremitalpa granti namibensis* (Chrysochloridae). *Journal of Arid Environments* **18**: 221-237.
- Haacke WD. 1969. The call of the barking geckos (Gekkonidae: Reptilia). *Scientific Papers of the Namib Desert Research Station*: 83-93.
- Hughes JJ, Ward D, Perrin MR. 1995. Effects of substrate on foraging decisions by a Namib Desert gerbil. *Journal of Mammalogy* **76**: 638-645.
- Krug CB. 2004. Survival in the Namib: adaptations of the striped mouse to an arid environment. *Transactions of the Royal Society of South Africa* **59**: 93-98.
- Nagy KA, Shemanski DR. 2009. Observations on diet and seed digestion in a sand dune lizard, *Meroles anchietae*. *African Journal of Herpetology* **58**: 39-43.
- Narins PM, Lewis ER, Jarvis JUM, O'Riain J. 1997. The use of seismic signals by fossorial Southern African mammals: a neuroethological gold mine. *Brain Research Bulletin* **44**: 641-646.
- Perrin MR, Boyer DC. 1994. The effect of rodents on plant recruitment and production in the dune fields of the Namib Desert. *Tropical Zoology* **7**: 299-308.
- Safriel UN. 1990. Winter foraging behaviour of the dune lark in the Namib Desert, and the effect of prolonged drought on behaviour and population size. *Ostrich* **61**: 77-80.
- Robinson MD. 1987. Diet diversity and prey utilization by the omnivorous Namib desert dune lizard, *Aporosaura anchietae* (Bocage), during two years of very different rainfall. *Journal of Arid Environments* **13**: 279-286.
- Seymour RS, Withers PC, Weathers WW. 1998. Energetics of burrowing, running, and free-living in the Namib Desert golden mole (*Eremitalpa namibensis*). *Journal of Zoology, London* **244**: 107-117.
- Tilson RL, LeRoux P. 1983. Resource partitioning in coexisting Namib Desert owls, *Bubo africanus* and *Tyto alba*. *Madoqua* **13**: 221-227.
- Williams JB. 2001. Energy expenditure and water flux of free-living dune larks in the Namib: a test of the reallocation hypothesis on a desert bird. *Functional Ecology* **15**: 175-185.

World Heritage Council / IUCN

- Bailey RG, Hogg HC. 1986. A World Ecoregions Map for Resource Reporting. *Environmental Conservation* **13**: 195-202.
- Dingwall P, Weighell T, Badman T. 2005. Geological World Heritage: A Global Framework. A contribution to the Global Theme Study of World Heritage Natural Sites. Protected Area Programme, IUCN. 51 pp.
- Goudie A, Seely M. 2011. World Heritage Desert Landscapes, Gland, Switzerland: IUCN. 44 pp.
- Udvardy MDF. 1975. A Classification of the Biogeographical Provinces of the World. IUCN Occasional Paper No. 18. IUCN, Morges, Switzerland. 41 pp.
- WHC-04/28.COM/INF.13B. 2004. The World Heritage List: Future priorities for a credible and complete list of natural and mixed sites. IUCN, Gland. 21 pp.

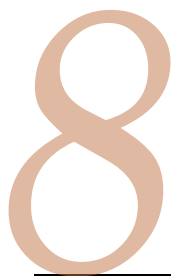




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Southward view over the Namib Sand Sea from the Kuiseb River Canyon (Paul van Schalkwyk)



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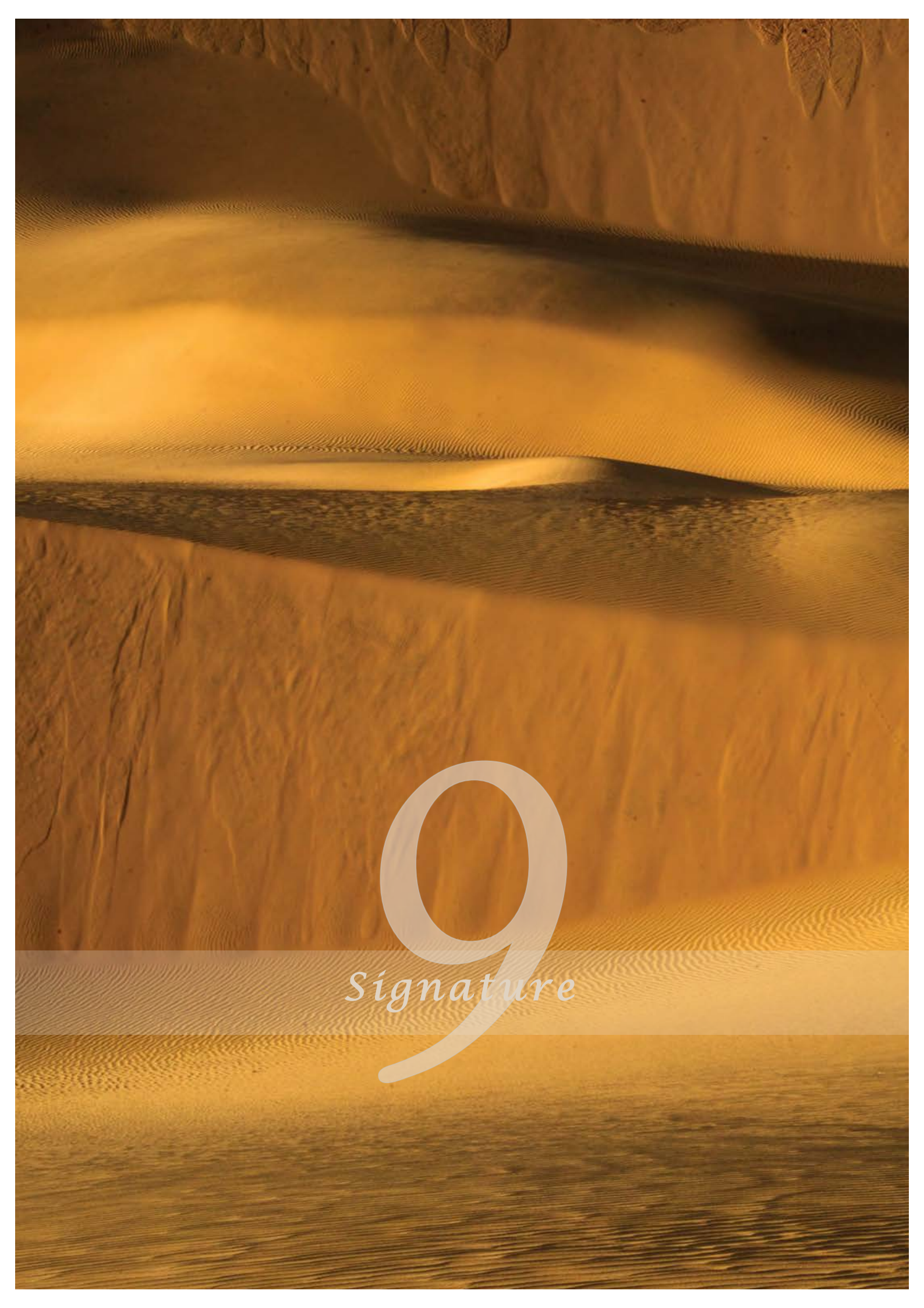
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9

Signature



The rhythmic interplay of sand, light and shadow in the Namib Sand Sea inspires artists and scientists alike (Paul van Schalkwyk)





9

Signature on Behalf of the State Party

The Hon. Kazenambo Kazenambo

Minister of Youth, National Service, Sport and Culture

Republic of Namibia







Namib Sand Sea

World Heritage Nomination

ANNEXES

© Republic of Namibia, January 2012.

Published by:

Namibia National Committee for World Heritage
Namibia National Commission for UNESCO, Ministry of Education
Private Bag 13186, Windhoek, Namibia.

Namib Sand Sea World Heritage Nomination. Seely, Mary
(Editor). 2012. Namibia National Committee for World Heritage.
Windhoek.

ISBN 978-99945-0-035-2

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associated photographers) unless noted.

Front cover image:

Endless sand supply from the South Atlantic to the Namib Sand
Sea at Sandwich Harbour (Paul van Schalkwyk)

Inside front cover image:

The Namib Sand Sea from space (NASA Johnson Space Center
<http://eol.jsc.nasa.gov>)

Back cover image:

An aerial view does not do justice to the magnificent dunes at
Sossus Vlei (Paul van Schalkwyk)

Namib Sand Sea

World Heritage Nomination

ANNEXES

**Nomination dossier to UNESCO for inscription
into the World Heritage List**

2012

Namibia National Committee for World Heritage

Annex 1

Management Plan



Namib Sand Sea Management Plan

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Abbreviations

CEO – Chief Executive Officer
DEA – Directorate of Environmental Affairs (in MET)
EIA – Environmental Impact Assessment
EMP – Environmental Management Plan
EPL – Exclusive Prospecting Licence
HQ – Headquarters / Head Office
IBA – Important Bird Area
IPA – Important Plant Area
IUCN – World Conservation Union
MDP – Management and Development Plan
MET – Ministry of Environment and Tourism
MFMR – Ministry of Fisheries and Marine Resources
NATH – Namibian Academy for Tourism and Hospitality
NGO – Non Governmental Organisation
NNF – Namibia Nature Foundation
NNP – Namib-Naukluft Park
ORV – Offroad Vehicle
TORs – Terms of Reference
SEA – Strategic Environmental Assessment
SSCSI – Sites of Special Conservation or Scientific Interest
WHC – World Heritage Centre

INTRODUCTION

This Management Plan sets out the vision, aim, objectives and underlying principles to ensure the maintenance of the outstanding values of the Namib Sand Sea. It also sets out the primary areas for actions to ensure effective and sustainable conservation management of those values and the attributes through which they are expressed. The mechanisms that sustain the geological, ecological and population dynamics that established and maintain the Namib Sand Sea are often at such a large scale that intervention is neither required nor possible, while other management activity is at such a small local scale that it is best implemented through on the spot decisions by conservation staff. Those minor activities are well known to management staff as routine procedures for which they have been trained and instructed through standard operating procedures. The Management Plan therefore does not address issues outside the scope of human abilities or those that are standard operational duties.

Effective implementation of the Namib Sand Sea Management Plan is only possible if all managers and conservation staff subscribe to its principles and strive to implement the identified actions. It can be expected that the plan has weaknesses that need to be identified and addressed in future revisions. All management and conservation staff are therefore encouraged to identify those shortcomings and the inevitable challenges that will emerge from activities and pressures that are not yet adequately addressed. Innovative solutions to existing and new challenges require accurate observation of the effects and records of the condition of places before and after the problems became clear. That routine yet often underappreciated contribution of conservation staff at all levels has allowed the progressive evolution of the management approach, which is accepted and appreciated as the basis of this plan and a critical component of future revisions.

The Management Plan will be reviewed every five years and revised where required through the input of all conservation staff and stakeholder consultation. Major interim changes or additions to the management plan, e.g. to address new conditions in the management framework or rapidly emerging threats, will consist of amendments approved by the management authority. Such amendments will be attached to the master plan for inclusion in the following review.

The Management Plan is a practical tool to guide activity and operational planning by all managers and stakeholders. It is essential that all existing staff and future appointees responsible for the Namib Sand Sea should familiarize themselves with its contents. It should furthermore be freely available to other stakeholders, and shall be specifically distributed to immediate neighbours and concessionaires. Appointed staff have specific responsibilities and duties, but everyone is encouraged to assist with implementation and improvement of the Management Plan as a team effort. Encouraging joint implementation will ensure that the extraordinary integrity of the Namib Sand Sea will continue as an international flagship of effective desert conservation.

VALUES AND ATTRIBUTES OF THE NAMIB SAND SEA

The integrity of the particular values and attributes that the Namib Sand Sea Management Plan will endeavor to conserve are:

(i) Outstanding natural beauty

- Large open spaces without visible scars or signs of human development, intrusive activity, or constructs
- Extraordinary clear visibility due to the absence of aerial pollution from dust, smoke, or industry
- Human impact and development footprint concentrated at specific point locations rather than an unmanageable wider distribution all over the area
- Ready access for visitors to the visually most compelling and superlative sites
- Well-argued restrictions on activities that may detract from the visitor experience developed through adaptive management
- Continued application of the precautionary principle to limit activities with unknown consequences until adequate information on their impacts is available

(ii) Active geological processes of global significance

- Unimpeded natural processes of washing sand onto beaches to be transported and deposited by wind to the interior
- Uninterrupted flows of air and water along rivers from the interior (eastern) margin into the sand sea that sculpts the geomorphology
- Sculpted and dissected deposits of sandstone and sediment that reflect the geological history
- Visual evidence of the effects of past climatic changes such as dead trees, river and pan sediments, coastal salt pans and isolated inselbergs
- Archaeological and historical remains that illustrate past human endeavor in the geological and geomorphological context
- Human activity restricted to those areas that can be rehabilitated by natural processes, e.g. inside river beds, on loose sand
- Closing, removal or relocating roads, infrastructure and tourist activities when they start to intrude and scar the landscape

(iii) On-going natural ecological dynamics that drive the evolution and interaction between the Namib Sand Sea residents

- Extreme aridity and low net primary productivity punctuated by highly variable and unpredictable rainfall events recorded through regular monitoring
- Dominance of loose, unconsolidated sand with low clay and silt content
- Gradients of decreasing fog-induced moisture from west to east
- Persistent and reliable southwesterly coastal wind, punctuated by brief periods of variable strong winds from the east
- Contiguous open spaces without any barriers that allow natural expansion and contraction of populations and species ranges reacting to natural variability or human activity
- Secluded wildlife refuges for breeding not affected by human activity that allow repopulation of areas affected by people or natural disasters

- Periodic nutrient input through ephemeral rivers, wind or vegetation responding to unpredictable rainfall events
- Natural response systems of species to detect and exploit resource concentrations that are unpredictable in space and time
- Unimpeded integration of interactions between species complexes inhabiting different habitat types, defined by the kind of surfaces, that allows dynamic evolutionary processes and interaction between different communities
- Absence of any human activities that affect the large-scale population dynamics and interactions between typical species within the various habitats
- Reported local-scale changes in population sizes and behavior of larger animals and birds that need to be monitored better

(iv) Extraordinary diversity of endemic species of special significance to science and environmental understanding

- Unfragmented and pristine habitat availability along the whole range of climatic conditions that maintains the genetic diversity of species
- Absence of natural or human-induced influences on the breeding success, age and sex structure, and interactions between species
- Absence of alien species that can significantly change natural interactions between resident species
- Well documented results from ongoing scientific research and long-term monitoring to explain the biodiversity, ecological relationships and fluctuations in species presence and population changes
- Long history of conservation management interventions to inform future decisions from past attempts to maintain ecosystem processes undermined by human exploitation, e.g. fencing to enforce hunting restrictions on herbivores and predators, artificial water supply for a more even distribution of large game, re-introduction of extinct species and management of tourism effects. These include:
 - Effective and focused law enforcement that restrained unsustainable human impacts
 - Effective interventions to limit the extent of natural disasters and human error, e.g. outbreaks of fire and the past eradication of alien species within the property
 - Healthy populations of species habituated to human traffic and activities that contribute to the overall visitor experience has resulted from the past and present efforts of committed and hardworking staff

The success of the management plan will be measured against the current status of the natural environment of the Namib Sand Sea.

The Namib Sand Sea is characterized by:

- **Wholeness:**

Attributes that demonstrate the outstanding values deserving of world heritage status on all four natural criteria are encompassed and abundantly represented within the identified borders of the property, namely

- (i) superlative natural phenomena of outstanding beauty;
- (ii) unrestricted geological and geomorphological processes encompassing the full range of hyperarid aeolian desert formations;
- (iii) uninterrupted ecological processes of global significance in understanding the evolution and maintenance of desert ecosystems and the distinct component communities of specially adapted organisms;
- (iv) extraordinary and well conserved biodiversity of endemic species proven to be of outstanding scientific and conservation significance

- **Intactness:**

More than 90% of the identified area is undisturbed wilderness almost totally devoid of human impact, which sets the standard for monitoring the degree of current and future usage. Well regulated and controlled tourism is the primary development likely to take place in the Namib Sand Sea through maximum sustainable utilization of identified areas rather than distributing impact throughout the wilderness areas through exclusivity. Access to all parts of the area is only envisaged for the purpose of conservation and research.

- **Absence of threats:**

There are currently no threats that may impact on the integrity of the attributes used to explain the outstanding universal value of the Namib Sand Sea, though some emerging issues relate to the conservation status of subsidiary attributes of the area. All development, including tourism, may be expected to put some attributes under stress. The challenge is to ensure early identification of what kind of stress is applied to which attribute through continued development and use and then identifying appropriate management responses. The precautionary principle, based upon an ecosystem management approach and minimal intervention, will be used to test potential management solutions to likely impacts caused by human exploitation of the environment.

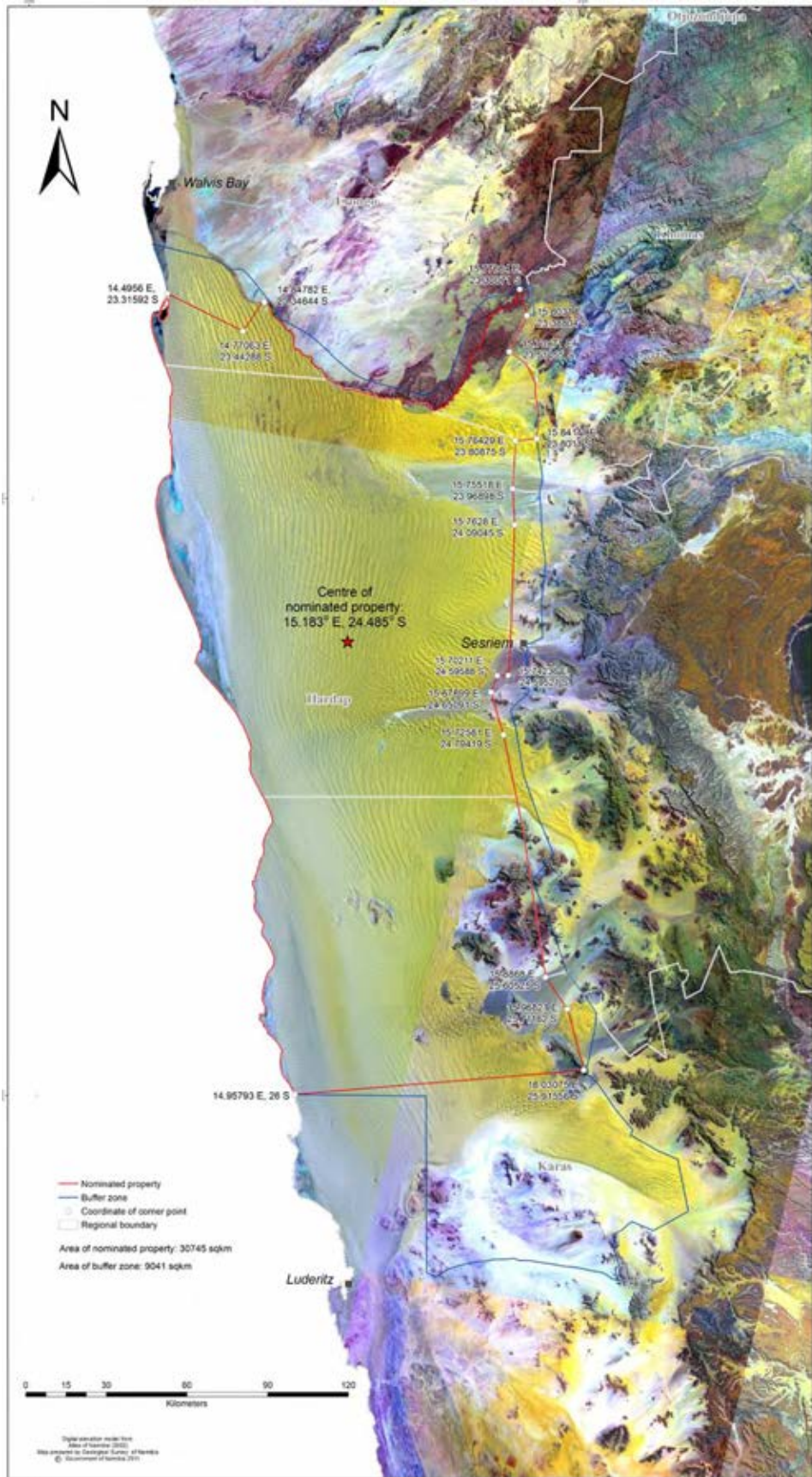
ENVIRONMENTAL OVERVIEW

The Namib Sand Sea was nominated as a World Heritage Site in February 2012 under all four natural criteria. The Namib Sand Sea will join the group of only 32 World Heritage sites around the world that meets all four criteria, including such internationally renowned sites as the Galapagos Islands (Ecuador), Grand Canyon (USA), Yellowstone (USA). It will be the first African site that meets all four natural criteria for World Heritage.

The Namib Sand Sea World Heritage site encompasses the core of the Namib-Naukluft Park.

The whole area receives on average less than 100 mm annual rainfall and over 70% of the area of the sand sea receives on average less than 50 mm rain per year. The extremely low annual rainfall is also hugely variable with an annual coefficient of variation ranging typically from 80% to over 100%, which implies that most of the area is unlikely to receive any rain for most of the time, but when it rains it will be very heavy rainfall with floods in the rivers. The evaporation along the inland part of the area is also very high. The high evaporation rates and low rainfall results in an average water deficit of about 2 m per year, which makes it one of the most extreme deserts in the world. When rain falls, it is mainly in January to April in the eastern and northern part, while records show that the southern part may receive rain during any month of the year.

Temperatures are generally moderate and fog is frequent along the coast (about 125 days per year on the coast dropping to about 40 days per year 80 km inland). Wind is a dominant feature. The dominant winds are mainly from the south and carry sand from the shore into the interior. At any time of the year when cold temperatures occur in the interior (e.g. Windhoek), but especially in winter, very strong, hot and dry winds can blow from the east. These strong winds are generally of fairly short duration, often blowing only for a few days. The general absence of moisture in the atmosphere means that the area cools off rapidly at night, and mornings are often cold, even during the middle of the summer. On rare occasions snow and frost have been reported on the dunes during winter.



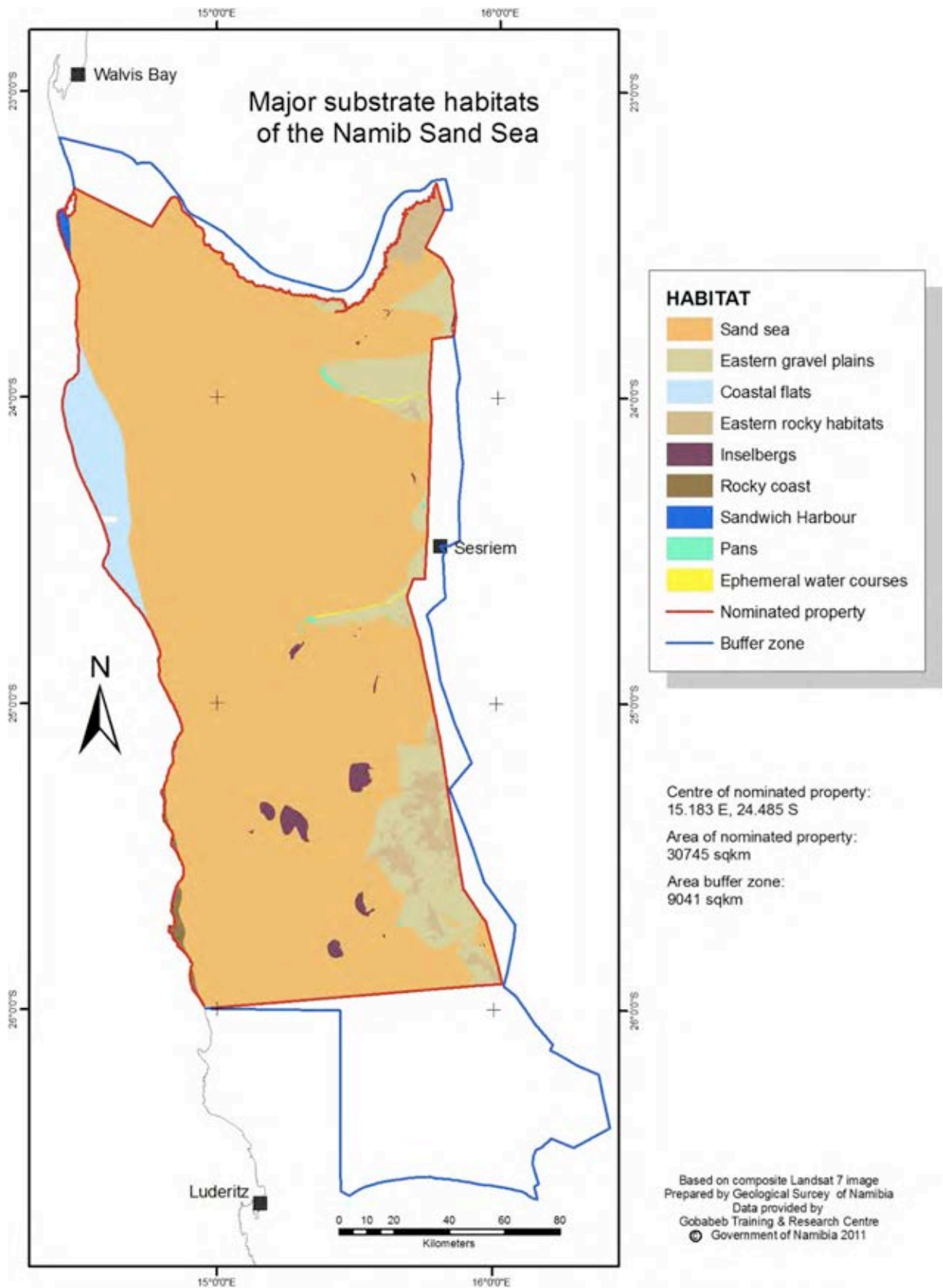
Map of the World Heritage Area and its Buffer Zone

It is important to understand why the Namib is a desert. First, the cold waters of the Benguela Current cool the air so much that little evaporation takes place over the South Atlantic Ocean close to Namibia. The evaporation that does take place does not rise up and develop into rain-bearing clouds but remains trapped in a layer from the sea to about 600 m above sea level. Moisture from the sea is therefore only seen as low clouds and fog. Second, moist tropical air from the Indian Ocean to the east or the tropical South Atlantic Ocean in the Congo basin to the north has usually shed most of its moisture before reaching the Namib coastal areas. Even when moist air with rain-bearing clouds does approach, it is usually blocked by the ocean winds from the south which blow inland for some distance, often to the escarpment. Any moist tropical air approaching the desert also descends over the escarpment, warming and drying out as it sinks down. These factors all combine to make rainfall an unusual event. Water flowing into the desert, which may disappear from local evaporation, is also rare as all Namibia's interior rivers, e.g. the Kuiseb and Koichab rivers to the north and south of the Namib Sand Sea, only flow during exceptionally wet years. The two main rivers that flow into and are stopped by the Namib Sand Sea, the Tsondab and Tsauchab, do not have large catchments and flow rarely. These rivers end at Tsondab Vlei and Sossus Vlei where they form pans bordering sand dunes.

The most spectacular feature is the Namib Sand Sea, an area of some 4 million ha of continuous sand dunes with rich geological, palaeontological, geomorphological, ecological, biodiversity, archaeological and historic values. The Namib Sand Sea is probably the major reason why tourists come to Namibia and not other African countries where they cannot experience such a spectacular sand sea. The Namib Sand Sea is therefore the main drawing card that sustains the tourist industry throughout Namibia.

The Namib Sand Sea harbors a considerable number of endemic species, though the ecological processes are relatively simple due to the sparse vegetation. Conservation should therefore focus on soil (or substrate) types that are easy to recognize as is listed below.

Habitats based on soil or substrate type within the Namib Sand Sea		
Category	Habitat	Notes
Coastal	Sandy shore	Sandy shores, on the southern side of bays where debris collects, support endemic species and are sensitive. Travel routes should be below the spring tide margin and avoid debris patches
	Rocky shore, coastal outcrops and bluffs	Rare and more sensitive than sandy shores with higher biodiversity. Vertical cliffs provide breeding habitat for cormorants and sometimes penguins. They often have shell middens and other sensitive cultural heritage.
	Salt pans / flats	Breeding grounds for Damara Terns and sensitive to scarring. Traffic should be strictly controlled
Terrestrial	Sand sea dunes	Shifting dunes that are relatively resilient. Support highly endemic wildlife. Extensive views of unscarred dunes are the main attraction for tourists. The excitement caused by fear is the main attraction for adventure tourism
	Sandy plains and interdune valleys	Sensitive to scarring and important habitat for wildlife. Traffic should be strictly controlled
	Gravel plains	Gravel plains surround inselbergs and are extensive on the eastern boundary. They are very sensitive to scarring and traffic should be strictly controlled.
	Ephemeral river courses	Ephemeral rivers support diverse plant and animal life that do not usually occur in the desert. They are important breeding and nesting areas. They are prone to alien invasives.
	Endorrheic pans and 'vleis'	End points of ephemeral rivers in the dunes, providing high scenic and biodiversity values. Sossus Vlei is the main tourist attraction. Tsondab Vlei is less scenic and spectacular and has important vulture breeding areas and archaeological sites.
	Inselbergs (Isolated Mountains)	Important relict (highly isolated) species and archaeological sites only occur there. Provide spectacular scenery from far away. Surrounding gravel plains easily scarred.
	Gramadulla areas and eastern rocky hills	Less sensitive than inselbergs but very important for biodiversity and as refugia and breeding areas for plants and animals



PART 1

MANAGEMENT FRAMEWORK

The Namib Sand Sea Management Plan is intended to ensure that all Namibians and visitors, regardless of economic status, origin, or personal circumstance, may continue to enjoy and experience the special qualities of the diversity of landscapes, sights and species resulting from the geology, ecology and biodiversity of the Namib Sand Sea.

2.1 VISION

Namibia will conserve the outstanding global values of the natural environment of the Namib Sand Sea in perpetuity for the enjoyment and edification of all people

The management plan clarifies how the Namibian government through the Ministry of Environment and Tourism will continue to conserve the outstanding values of the Namib Sand Sea. MET will do this by applying its tested systems of integrated management planning and operational implementation by testing conservation actions and outcomes against the qualities for which the Namib Sand Sea is renowned.

2.2 PURPOSE

- ❖ *Aesthetic wilderness* – To conserve the austere beauty and continuous expanses of majestic dunes of the Namib Sand Sea, together with their outstanding diversity of endemic species integrated into vibrant and resilient communities, within a setting virtually devoid of human constructs. It requires ensuring unimpeded vistas over and within the property with a low degree of modern visible human impact and careful evaluation of any proposed development to ensure that it does not affect these qualities.
- ❖ *Geomorphological variety and Ecological continuity* – To ensure the sense of place of the Namib Sand Sea, the diversity of landforms where natural forces continue to shape and renew the dune systems and the diversity of healthy ecosystems and their dynamic animal and plant populations are maintained. An area of sufficient size and continuity shall be conserved with adaptive management responses, informed by appropriate environmental monitoring, to mitigate the degree to which human activities and societal development initiatives may have an effect on the integrated geological and ecological networks and processes.
- ❖ *Appreciation and Understanding* – To promote and explain the dynamic processes that shape and maintain the dunes, and the adaptations that allow life to flourish in an environment of limited resources, through universal access, continuous research and monitoring and distribution of information at all levels of society. Specific strategies need to be continuously developed for access to identified parts of the property to meet national and community aspirations for development, economic prosperity and entrepreneurial opportunities while still conserving the integrity of the system and maintaining appropriate levels of research and education.
- ❖ *Human interaction* – To manage challenges in maintaining the integrity of the Namib Sand Sea within the context of dynamic cultural and economic changes in our society that

allows the Namibian people to learn and profit from its environment. Every component of the Namib Sand Sea has different challenges if the integrity and authenticity of aesthetic, ecological, prehistorical, historical and cultural traditions of all Namibians are to be maintained. Adaptation to their natural environments through innovation is a cultural achievement that is shared by most Namibian communities. Maintaining that tradition under the pressures of rapid globalization and new economic opportunities requires interactive management through continued consultation between stakeholders and the Ministry of Environment and Tourism.

Conservation of the essential qualities of the Namib Sand Sea is well established through a long history of practical conservation experience. That experience showed minimal intervention from 'hands-off' approaches to be very effective, as the remoteness and sheer scale of the natural processes of the Namib Sand Sea have defied the degree to which humans could affect those qualities. The management plan will continue to build on that experience in order to guide activities and to promote appreciation of the Namib Sand Sea, its natural processes, and the diversity of its species.

2.3 OBJECTIVES

- ❖ To conserve and manage the landscapes, ecosystems, habitats and biological diversity of the Namib Sand Sea.
- ❖ To manage wildlife populations and habitats to maintain healthy biological diversity and ecosystem stability under natural climatic variability and current and emerging development demands and practices.
- ❖ To promote and support appropriate land and natural resource uses that are compatible with the values and attributes of the Namib Sand Sea with emphasis on well managed tourism, flagship species, environmental awareness and promotion of the property.
- ❖ To promote development opportunities through the management of appropriate enterprises and other relevant mechanisms to foster job creation, social and economic upliftment and rural development in the Karas, Hardap and Erongo regions.
- ❖ To encourage and support strategic and innovative new economic enterprises without compromising on sound conservation principles and practices.
- ❖ To establish strong partnerships and appropriate institutional mechanisms for managing the landscape and ecological processes together with neighbours, local communities and other stakeholders within the context of development and mutual benefit for all partners.

Effective management of the Namib Sand Sea within the Namib-Naukluft Park has always required close cooperation between the mandated management authority (the Ministry of Environment and Tourism) and other related government organizations, decentralized local and regional governments, traditional societies, local residents, bodies engaged in tourism, researchers and NGOs (hereinafter referred to collectively as "stakeholders"). The Management Plan addresses issues such as conservation, research, monitoring, enforcement, education, traditional practices, and cultural heritage resources within the context of aspirations for national and regional development.

2.4 MANAGEMENT SYSTEM

The management approach to the Namib Sand Sea conforms to the policies and procedures of the Government of the Republic of Namibia as advised by the Office of the Prime Minister. It consists of an integrated system of strategic (long-term), operational (medium-term), and activity (annual) planning. The property is wholly on state land, thus is legally held in trust for the Namibian nation and subject to procedures for public asset management. As a legally proclaimed protected area on land, management of the area is entrusted to the Ministry of Environment and Tourism (MET) and is subject to specific regulations regarding use. Vast areas of the Namib Sand Sea have been legally protected and restricted areas for a long time, some of which have been protected since 1907. The inaccessibility of large areas for a long time, until off-road vehicle technology was sufficiently advanced to access almost the whole area in recent times, has added an additional layer of protection. Management approaches have evolved and adapted over this long period to ensure the best possible conservation outcomes despite a diversity of management challenges that appeared and disappeared again from emergent economic prospects, technological innovation, and socio-political imperatives. The nearly pristine condition of the nominated property is evidence of the success of past efforts to confront challenges that were often based on short-sighted and speculative economic opportunism. The Management Plan shall continue to evolve within the context of the management of surrounding public and private conservation areas, including participatory processes for the co-management of wilderness areas.

The principal conservation philosophy for the Namib Sand Sea is to follow an ecosystem approach of integrated management and sustainable use of resources. All the habitats in the Namib Sand Sea have specific geological and ecological processes that are fundamental to the plants and animals inhabiting those areas, as well as interactions between species within and between habitats. There are no uniform solutions that can be applied in all situations, even where the habitat is the same, thus the experience and good sense of the conservation staff on the ground is important.

An ecosystem approach requires that implementation of multiple activities have to be coordinated for:

- Ecosystem level planning;
- Defining cross-jurisdictional management goals;
- Developing and testing co-management approaches;
- Adaptive management;
- Ecosystem zoning;
- Long-term observations, monitoring and research.

This current management plan shall be implemented in an efficient and systematic way through annual cycles of preparing an *Annual Work Plan* and *Budget*. Those annual projections will be based on the Management Plan and incorporate the Strategic Plan, Medium-term Planning and Rolling Budgetary System of the Directorate of Regional Services and Parks Management and MET. These work plans will, as far as practical, implement the areas of work listed under Part 2 of this management plan. The work plan should cover:

- **Routine management issues** for conservation such as, for example, managing water points, law enforcement, extension work, in-service training, promotion and incident-book record keeping.
- **Development issues** to improve the capacity for conservation such as, for example, infrastructure developments, wildlife reintroductions and priority research.
- **Monitoring activities** to systematically and opportunistically collect, report and record information such as key biodiversity indicators, tourism activities and impacts for annual analysis and interpretation to inform adaptive management

- **Research support** to gather and report priority information and address knowledge gaps through, for example, implementing projects, monitoring and the research permit system.
- **Administration** including work plan and budget preparation, regular reporting and meetings.

Progress on the implementation of the annual work plan and expenditure reports against the approved budget should be presented quarterly to supervisors. At the end of each annual cycle, an internal **Annual Report** and **Financial Report** will be prepared to assist in drafting the work plan and budget for the following year. The Annual Report will use the format of the work plan, and include outcomes and outputs, achievements, challenges, and cumulative (time-series) information from the monitoring programme. The cumulative information, showing trends over time, will be used to assess ecological conditions. The Annual Work Plan and Budget shall be approved by the Director of Regional Services and Parks Management for implementation with oversight from the Permanent Secretary of the MET and ultimately the National Assembly and National Council of the Republic of Namibia.

Some immediate issues, e.g. from new exploration licenses, tourism concessions, innovative entrepreneurial activity to provide tourist services, or natural disasters can be expected to occur without advance notice. That would require an immediate response by staff on the ground as well as supervisors. The policy of Environmental Impact Assessments (EIA) and prior approval of Environmental Management Plans (EMP) needs to be strictly enforced. Where EIAs or EMPs have not been approved, the Permanent Secretary must be informed immediately in writing. The values and attributes for which the Namib Sand Sea will be nominated need to be specifically addressed during EIAs and factually proven. Broad statements based on a lack of information or absence of research shall not be acceptable as the contractors are required by law to provide factual information that can be used to make informed decisions. Innovative approaches to enhance the experience of visitors should be allowed to a limited extent so that the actual impact of such activities may be evaluated. Where feasible, such activities should be restricted to the buffer zone and by applying the precautionary principle to limit the potential impact.

2.5 GOVERNANCE

The Namib Sand Sea and all of its buffer zone are within a legally proclaimed protected conservation area on state land. The Ministry of Environment and Tourism is mandated to manage the property on behalf of the Namibian nation. The management system is therefore subject to public oversight and transparent reporting to democratically elected national representatives and open to public scrutiny and debate. Such transparency assists in developing approaches and policies to address identified problems and emerging issues, often extensively criticized in public. The known debates regarding unresolved claims to land and resources, as well as conflicts with other ministries jealously guarding their prerogatives and mandates, cannot be resolved at the operational level. For practical purposes the management system is designed to conform to the rules and regulations that ensure transparency and accountability, e.g. the Public Service Act, the State Finance Act, the National Planning Act, the Labour Act, and other relevant laws that govern how public officials manage state assets. The procedural components of the management system furthermore comply with legal instruments and policies designed specifically for environmental conservation, *inter alia* the Nature Conservation Ordinance, the Environmental Management Act, the Tourism Act, the Concessions Policy, and the Lands policy.

The buffer zone is also wholly under the management authority of the MET and will be managed as if part of the identified property. However, more leeway will be granted in that area for intrusive and experimental activities, with specific reference to accommodation facilities for

visitors and staff, visitor support infrastructure (e.g. waste disposal, access roads, health and educational facilities), service infrastructure (e.g. shops, filling stations), adventure and intrusive recreational activities, and other components to a well-rounded experience.

The direct management authority for the nominated property is the Directorate of Regional Services and Parks Management within the Ministry of Environment and Tourism, though other organic bodies within its parent body such as the Department of Tourism, the Directorate of Scientific Services and the Department of Environmental Affairs have subsidiary responsibilities that have direct and indirect effects on management procedures. In addition, the Ministry of Fisheries and Marine Resources and other national, regional and local government organizations have particular responsibilities within the context of national laws and their accompanying regulations.

Authority	Area of Responsibility
Department of Agriculture, Ministry of Agriculture, Water & Forestry (MAWF)	Pesticide licensing & migrant pest control (locusts)
Department of Agriculture, MAWF	Livestock density enforcement and agronomic licensing
Department of Water Affairs and Forestry, MAWF	River Basin management, water extraction licensing and pipeline construction
Ministry of Defense (MoD)	Marine patrols and law enforcement
Department of Environmental Affairs, Ministry of Environment and Tourism (MET)	Development, environmental assessment and management
Directorate of Scientific Services, MET	Wildlife censuses, species relocations, research permit approval and reporting
Department of Tourism, MET	Tourism planning, licensing and infrastructure maintenance
Department of Tourism, MET	Promotion and awareness
Ministry of Finance (MoF)	Fiscal planning and economic prioritization
Ministry of Finance (MoF)	Public Funds expenditure and accounting procedures
Ministry of Fisheries and Marine Resources (MFMR)	Commercial and Recreational fishing licenses, coastal management enforcement
Ministry of Mines and Energy (MME)	All Exploration and Mining Licenses (also offshore)
Ministry of Mines and Energy (MME)	Powerline construction
Ministry of Mines and Energy (MME)	Petroleum exploration and transport
Ministry of Regional and Local Government, Housing and Rural Development (MRLGHRD)	Town and industrial development
Ministry of Regional and Local Government, Housing and Rural Development (MRLGHRD)	Coordination with Traditional Authorities & Regional Government
Ministry Trade and Industry	Industrial development planning & licensing
Ministry of Works and Transport (MWT)	Ship licensing and operational enforcement
Department Transport, MWT	Civil Aviation licensing and operational enforcement
Maintenance Division, Department of Works, MWT	Infrastructure maintenance

Roads Construction Company (reports to MWT)	Road maintenance and construction
National Planning Commission (NPC)	Development planning coordination
Regional Governments (Erongo, Hardap, Karas)	Regional development planning & infrastructure needs assessments
Town and Village Councils (Lüderitz, Walvis Bay)	Local development planning

The management plan represents the policies and intentions of the Ministry of Environment and Tourism (MET) as the responsible authority for the law under which the Namib-Naukluft Park has been declared. The integrated mechanism through which all conservation areas and wildlife resources are managed in Namibia is intended to make optimal use of limited manpower and financial assets. It is not envisaged that the nominated property will be managed in isolation. Although the management system has some disadvantages, as the Namib Sand Sea will not be managed as a distinct entity, it does benefit from the flexibility of having access to a large potential resource base and being managed in accordance to a national system of a wider protected area network. All decisions, actions and activities in the Namib Sand Sea have to adhere to legal requirements and should endeavor to support the implementation of the Management Plan.

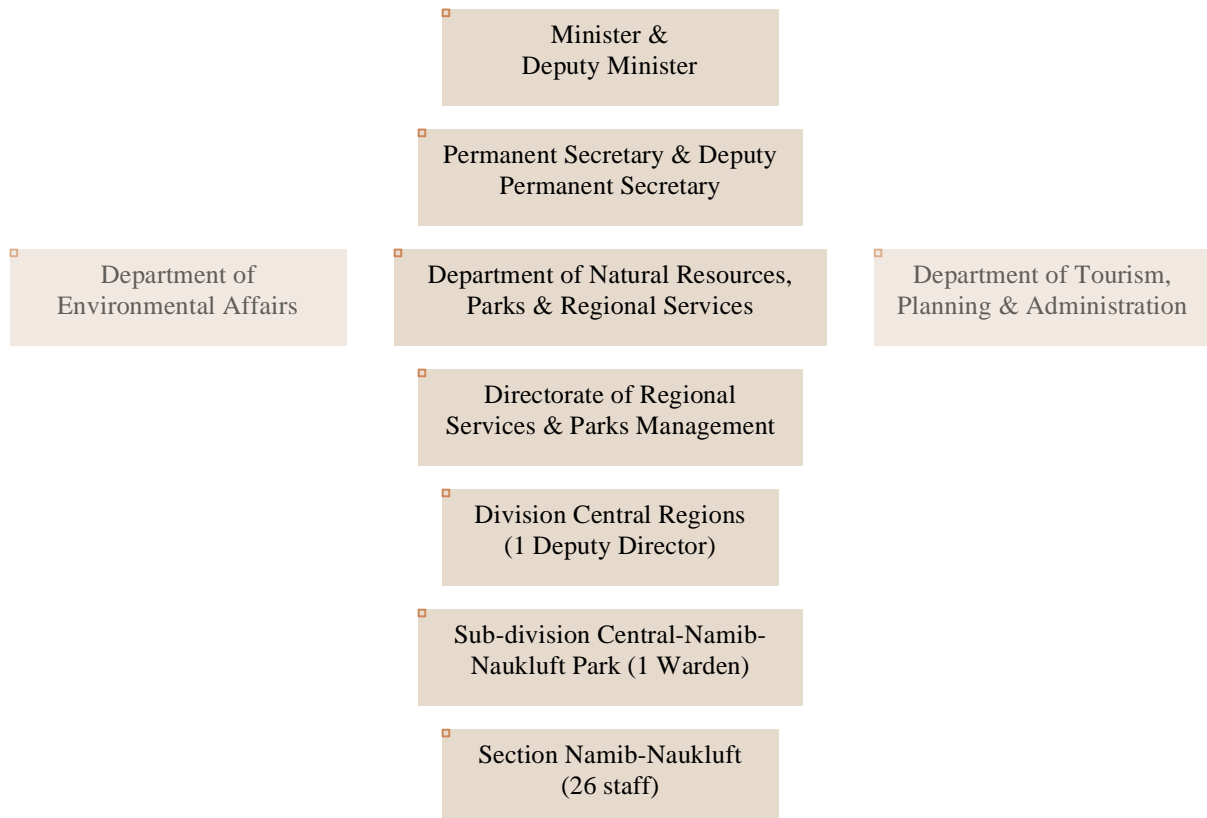
The Management Plan is a tool to implement legislation and regulations, as well as policies, research results, and with other relevant literature on the area. It was designed and structured to be priority focused and action orientated to facilitate implementation and the achievement of outputs and outcomes. The plan is linked to an annual cycle of management and oversight, involving the preparation of annual work plans, budgets and reporting based upon the outputs of activities from previous years. Annual work plans ensure pro-active precautionary planning to deal with emerging issues and identified problems, environmental concerns predicted through monitoring, and the results of new research and priorities that are set in consultation with stakeholders. The plan is therefore “principles” based in sections that allow easy reference and that essentially serve as mini policy statements. Not all eventualities can be planned for but, if the basic principles are established, decisions can be readily made against these principles to meet the objectives and purpose of effective conservation.

2.6 MANAGEMENT RESPONSIBILITIES

Senior staff appointed to run the park, i.e. the Chief Warden and Wardens, and their counterparts in the MFMR, are ultimately responsible for ensuring that the management plan is implemented in effective and efficient ways and that legal regulations and policies are enforced. They are also responsible for ensuring effective day-to-day management as well as for dynamic, responsive and pro-active annual planning and contributing to longer-term planning. The rangers and scouts, together with their support staff, are responsible for carrying out the activities that are scheduled in the annual plans and to provide regular feedback and suggestions that would allow pro-active planning and early identification of emergency interventions that may be required.

A network of ranger stations and access control points are in place and are staffed by personnel that have been specifically trained through formal education networks or in-service training modules. This training is primarily based upon local knowledge and expertise in Namibian institutions. The stations and staff are equipped to carry out specific tasks according to identified priorities to meet management goals. Funds to ensure implementation of activities related to the management system and the development and maintenance of adequate infrastructure are primarily sourced from public funds. The allocation of funds is guided by target sums set five years in advance (known locally as the Medium Term Expenditure Framework) to allow forward

planning towards strategic objectives with measurable outcomes. Reiterative annual budget takes place to implement planned activities within this overall framework. The funding system allows for additional public funding to be made available to meet unanticipated emergency priorities. The funding framework allows for forward planning and ongoing consultation to meet identified performance targets. In addition, supplementary funds may be sourced through other mechanisms, e.g. opportunities for donor investment through bi-decadal National Development Planning strategies; development projects and programmes supported by international mechanisms such as the Global Environmental Fund and Namibian Wildlife Trust, and interagency cooperation with other public and non-governmental partners within Namibia. It is the responsibility of staff at all levels to understand the financial system in order to timeously plan their expenditures in order to ensure that the work plans can be implemented and that future needs are identified well in time.



2.7 MANAGEMENT PLAN REVIEWS

The Management Plan will be thoroughly reviewed and, where necessary, revised, every five years. The next review is scheduled for 2016. Any changes that must be made in the interim will be recommended by the Chief Control Warden in consultation with the Chief Warden and approved by the Director and Permanent Secretary as signed and dated amendments to the Master Management Plan.

Copies of the master Management Plan and amendments shall be held at offices within the Namib-Naukluft Park (MET Ganab, MET Zais, MET Escourt and MET Sesriem) and adjacent areas (MET Walvis Bay, MET Swakopmund and MET Lüderitz) and at MET HQ offices (Chief Warden, Chief Control Warden, Deputy Director and Director of Regional Services and Parks Management, Directors Environmental Affairs, Scientific Services, Tourism, Office of the Permanent Secretary). Additional copies will be held by the Gobabeb Centre, CEO of NWR, CEO of NTB, MFMR (Swakopmund, Walvis Bay, Luderitz and HQ Windhoek), MME (Commissioner of Mines, Geological Survey), Regional Governments (Chief Regional Officers and Planning Officers of Erongo, Hardap and Karas Regions), National Planning Commission, National

Heritage Council, National Commission for UNESCO, World Heritage Centre, Municipality and Village Councils (CEOs Aus, Lüderitz, Walvis Bay) and ≠ Aonin Traditional Authority.

The iconic status of the Namib Sand Sea within the national context, the popularity of its well-known attractions to domestic and international tourists, and the uniqueness of its natural processes, also results in intense interest from other government agencies, public enterprises, non-governmental agencies, private enterprises, conservation focal groups, and neighbouring communities. These stakeholders contribute in varying degrees to the management system of the Namib Sand Sea, though the specific inputs of different stakeholders have never been systematically explained. Untangling and elucidating the relevancy of contributions from various stakeholders to the management of the Namib Sand Sea is one of the challenges that will be clarified and should be formally included in a future review of the management plan.

The Namib Sand Sea Management Plan must be viewed as a valuable and central document by all management and development staff and stakeholders that have activities or development initiatives related to the area. They should be familiar with its contents, and should make use of it to familiarize new staff with the vision, aims, objectives and policies relating to world heritage in general and the Namib Sand Sea in particular.

PART 2

MANAGEMENT ACTIVITIES

The management activities are intended to ensure that the values for which the Namib Sand Sea is nominated continue to be enjoyed and appreciated by the majority of people. All management staff should appreciate that change is an inevitable attribute of the Namib Sand Sea, whether it is natural in terms of the geomorphological, ecological and evolutionary processes of the area, or whether it is of human origin. Culture, technology, innovation and development are as dynamic as natural processes. Appreciating and understanding the dynamics of such changes are essential for adaptive property management and a prerequisite for effective long-term management. Where clear guidance and information are unavailable, the following perspectives should guide on-the-spot decisions:

- **Continuity** – past management efforts and a long history of active research provides a basis of experience that should not be disregarded. Applying a different aspect of the precautionary principle suggests “*If it is not broken, don’t try to fix it*”.
- **Reactive intervention** – it is inevitable that new issues and threats will emerge that require attention. Where possible EIAs and research should be used to regulate human activities and clarify how people may affect local diversity and the scenic beauty of the Namib Sand Sea
- **Evolutionary or reiterative protocols** – management decisions will be based on the knowledge, policies, attitudes, and legal instruments at the time. As these change they will allow new protocols to be adopted and implemented that may either be more permissive or more restrictive. Adaptive management is expected to generate controversy, though appropriate monitoring, transparency, consultation, and timely distribution of information to stakeholders may mitigate the degree of criticism.
- **Affordability** – it is a reality that resources will never be adequate for all desired actions and resources may vary over time. Prioritization and cumulative implementation of activities, based upon long-term objectives, may address the most pressing issues.
- **Implementation** – activities need to take into account the human and physical resources that are in place. Staff at all levels should be encouraged to be innovative and to use their own initiative to achieve specific outcomes and to experiment with potential solutions, within limits, as are prescribed in the action plan.
- **Knowledge base** – stakeholder expectations are high due to the iconic status of the Namib Sand Sea and the desire from entrepreneurs to benefit from it. Stakeholders do not like ‘NO’. However, management actions should be based upon available knowledge and within the means available for active intervention. As emerging issues often do not have clear solutions, it is envisaged that the precautionary principle will frequently be invoked until adequate knowledge and resources are available. Nevertheless, limited experimentation with new ideas is encouraged as part of the process of finding solutions.
- **Non-intervention** – the natural geological and ecological processes in the Namib Sand Sea will require little overt intervention, though the variable dominance of these processes in different parts of the property is still poorly understood. Regular monitoring and recording spot observations are valuable tools to clarify the different degrees of natural restoration processes in the system.

2.1 LANDSCAPE MANAGEMENT

Open, contiguous landscapes are essential to ecosystem functioning, unrestricted wildlife movement, and maintaining the essential value of outstanding natural beauty. Achieving the desired outcome largely relies on the effective implementation of existing policies and regulations achieved through consultation and communication between authorities with different areas of responsibility.

Actions	Monitoring	Output
1. Re-activate and ensure regular meetings of the Strategic Management Forum established for the NNP	Bi-annual meetings	National planning will include specific reference to the Property
2. Identify and engage with additional strategic partners by disseminating information and holding targeted planning meetings	MET contributions to sectorial and local planning	Distinct sectorial and local development plans referring to the Property
3. Develop and maintain a socio-economic development plan by establishing forums and communication channels to integrate landscape and biodiversity conservation	Documents and records of meetings that provide input from different stakeholders	Draft plan to be included within five years
4. Develop an appropriate and flexible institutional mechanism for local implementation	Consultative meetings with stakeholders	Established forums for consultation, e.g. Concessionaire Forum
5. Identify priorities and opportunities for new socio-economic initiatives	Mainly stakeholder driven	Suggestions and approval for new initiatives
6. Where necessary, establish formal agreements to facilitate consultation and decision-making among stakeholders	Implementation of Consultative Forum for NNP	Records of Consultative Forum meetings

2.2 CO-MANAGEMENT WITH NEIGHBOURS

The Ministry of Environment and Tourism, in its Strategic Plan (2007), has embraced the exploration of co-management approaches to landscapes and biodiversity conservation across different land tenure systems with different land owners or custodians. The envisaged outcomes include the establishment of co-management committees with neighbours to promote (a) conservation and sustainable natural resource management and (b) socio-economic development. Co-management approaches across contiguous landscapes will promote more effective landscape and biodiversity conservation across a diversity of land uses. This also will enhance sustainable land management to promote economic development, improve livelihoods and combat rural poverty in sustainable ways. A diversified approach to a shared vision that, by definition, is inclusive and partnership based, will support the Ministry of Environment and Tourism to implement integrated ecosystem conservation and priority actions and programmes. It shall also help to mitigate and prepare for the impacts of climate change by opening up systems, working collaboratively, and diversifying production systems through collaborative mechanisms. Implementation and testing effective means of co-management will be initiated through the GEF-funded NamPlace programme, of which the Sossus Vlei area of the Namib Sand Sea is one of the experimental test areas.

Actions	Monitoring	Output
1. Establish a local Co-management Committee in the Sossus Vlei area to evaluate mechanisms for functional management between state conservation areas and neighbours	NamPlace meeting records	Effective Co-management Committee by 2016
2. Develop best practices guidelines for expanding shared management to different areas	Suggestions and consultations on guidelines	Results of shared management approaches
3. Establish collaborative agreements on shared responsibilities for priority management issues	NamPlace meeting records about potential shared responsibilities	Success rate of agreed upon management outputs

2.3 ZONATION

Landscapes and ecosystems are optimally managed and used through zonation that accounts for the values and current uses of the area. A zonation map for the Namib Sand Sea has not yet been developed and will therefore be prioritized. Internationally recognized zonation categories will be applied where feasible (Table 2.3.1).

Table 2.3.1: Categories used for Zonation of the Namib Sand Sea (based upon IUCN classification of Protected Areas)

Zones		Activities
a)	Strict Nature Reserve (IUCN category 1a)	<ul style="list-style-type: none"> Highly sensitive and high value conservation areas Non-intrusive scientific monitoring only Minimal mechanized access No-fly Zone No permanent structures
b)	Wilderness Area (IUCN category 1b)	<ul style="list-style-type: none"> Sensitive habitats and sites High value “sense of place” Low impact usage No mechanized access No permanent structures
c)	Specially Protected (IUCN category 2)	<ul style="list-style-type: none"> Managed for conservation and controlled tourism Approved mechanized access Low-impact Burra Charter structures
d)	Natural Monument (IUCN category 3)	<ul style="list-style-type: none"> Specific outstanding features, including landscapes, geological features, fossil deposits, ecological refuges, archaeological sites, shipwrecks, historical settlements, areas of heritage value Controlled scientific access only
e)	Conservation Management Areas (IUCN category 4)	<ul style="list-style-type: none"> Habitat or species management areas under active management No-fly zoning may apply Sustainable delivery of benefits to the area No public access
f)	Protected Landscapes (IUCN category 5)	<ul style="list-style-type: none"> Relatively open access for public enjoyment Higher intensity and lower regulatory areas

		<ul style="list-style-type: none"> • Non-consumptive and non-intrusive usage • Controlled business ventures
g)	Resource Protected Areas (IUCN category 6)	<ul style="list-style-type: none"> • Sustainable use of natural resources, e.g. recreational fishing, consumptive harvesting and intrusive adventure tourism within regulated limits on consumption • Managed resources to ensure long-term protection of ecological processes and maintenance of biological diversity • Support development through a sustained flow of natural products and services • Consumptive commercial activities subject to Environmental Impact Assessment baselines and approved Environmental Management Plans

Zonation is based upon the concept of sensitivity. Documented research knowledge, of the biodiversity, geological context, climate, and known ecological responses to various kinds of human intrusion or exploitation, is used to determine sensitivity. It is a mechanism to harmonize future partnerships that may unlock the economic potential of the area within the context of landscape and biodiversity conservation. An agreed zonation map will minimize potential conflicts between activities and partners.

Actions	Monitoring	Output
1. Prepare draft zonation map for discussion and proposed activities per zone	Zonation map drafts and inputs	Draft zonation map Dec 2012
2. Distribute proposed zonation map and associated regulations to all stakeholders for consultation	Distribution lists and proposed regulations	Zonation map approved by 2014
3. Distribute and implement approved zonation map	Maps at all relevant conservation offices, ranger stations, entry points, and tourist industry facilities	Zonation of activities
4. Formalize legal instruments by drafting regulations for zonation	Draft regulations approved by cabinet	Legal regulations gazetted
5. Inform visitors about zonation and rationale	Information, booklets, etc. widely available	Visitor survey on attitudes to zonation

2.4 TOURISM MANAGEMENT AND DEVELOPMENT

Tourism management is a specialized activity that includes, *inter alia*, understanding of economic processes, information provision and customer uptake, marketing and promotional strategies, evaluation of visitor behaviour and desires, and coordination between different service providers at national and regional level. At the local level, uncontrolled tourism industry growth and the demand for exclusive access to undisturbed areas are potentially the biggest overall threats to the character, beauty, diversity and integrity of the Namib Sand Sea. Tourism growth has caused other popular world heritage sites to be put on the World Heritage in Danger List. In the Namib Sand Sea, the sheer size of popular destinations such as Sossus Vlei, combined with good planning, zonation, management and collaboration between the conservation and tourism sectors, may still allow visitors to have a high quality eco-friendly experience that includes a sense of place, isolation and wilderness despite large numbers of visitors. However, that will not be the case if the demands and guidance of tourist operators and entrepreneurs are blindly accepted. The

large number of visitors to popular destinations such as Sossus Vlei is already causing problems by the amount of waste that has to be disposed of, while the growth curve of visitors indicates that the number will continue to rise. Widely distributed tourism facilities exacerbate the problem with waste, while the rising cost of accommodation is effectively excluding Namibians from areas such as Sossus Vlei. Tourism management therefore requires active engagement by other specialist agencies of the MET that do not fall under the Directorate of Regional Services and Parks Management and that have a specific mandate to address issues related to the tourism sector. Tourism development planning would also promote benefit sharing, income generation and investment opportunities for all Namibians through mechanisms such as the MET's Concessions and Tourism policies. At the same time, greater focus on the values of the property may be achieved by introducing a joint branding scheme by various heritage and ecology authorities.

Practical activities by conservation personnel envisage managing those aspects that can be controlled by the wardens until a more comprehensive tourism development plan for the Namib Sand Sea has been developed. These activities will include: tourism impact monitoring in order to estimate carrying capacities, affordable access for Namibians, refurbishing an Information Centre at Sesriem, providing relevant information materials to improve visitor appreciation, improving waste disposal procedures, better regulation of aerial flying heights and introducing no-flying zones, and improved training and registration of guides.

Actions	Monitoring	Output
1. Initiate the development of a detailed Tourism Development Plan through the Directorate of Tourism and Namibia Tourism Board	TORs developed and responsible officer / consultant appointed	Draft Tourism Development Plan for discussion
2. Ensure effective reporting of monthly and annual tourism numbers and comparison with national and Etosha National Park numbers	Monthly tourism entry reports	Improved analysis of Namib Sand Sea as a tourism destination
3. Design and open Sesriem Information Centre and point location information boards	Operational information centres	Better knowledge about special qualities of the Namib Sand Sea
4. Continue to monitor and replace or improve signage and visitor information	Ad hoc through incident book system	Quarterly and annual reports on condition of signage and information boards
5. Monitor condition and tourism pressure at point locations through technology, e.g. monitoring cameras	Install and monitor trail cameras	Annual analysis of tourism impact and testing mitigation measures
6. Test and implement waste disposal mechanisms that would allow for a doubling of current visitor numbers	Evaluation report of available systems and capital project recommendation	Improved management of visitor waste
7. Promote the establishment of low-cost tourism accommodation to restrict the burgeoning traffic and waste disposal issues to specific point locations	Evaluation report and recommendation to cabinet	Improved accessibility to Namibians as well as improved waste management
8. Establish aerial tourism guidelines in consultation with operators and Civil Aviation	Guidelines by Civil Aviation	Improved sense of place and reduced wildlife disturbance
9. Develop and implement a Namib	Tourism Charter Drafts	Sharing of

Tourism Charter to improve co-management between officials and operators	and workshop records	responsibilities and improved relationships in sector
10. Introduce joint branding and advertising of appropriate activities by the NTB, NHC, WHC and <i>eco-awards Namibia</i>	Guidelines on procedures and requirements for joint awards	Value-sensitive tourism activities and development
11. Develop Namib Sand Sea guide system and syllabus in consultation with NATH and the Gobabeb Centre	Syllabus by NATH and Gobabeb Centre	Training course and guide registration implemented

2.5 PROSPECTING AND MINING

Prospecting and mining activities are the second most important consumptive economic activities challenging the conservation effort for the Namib Sand Sea. Despite a formal policy on Mining and Prospecting in Protected Areas and National Monuments (1999) and Minerals Policy of Namibia (2003) that recognize the need for restricting non-strategic minerals in protected areas, exclusive prospecting licenses that are the precursor to mining licences are still being granted. The Ministry of Mines and Energy has agreed to put a moratorium on the granting of exploration licenses within the Namib Sand Sea, but provision still has to be made to manage any potential activities in that context in line with the international World Heritage and Mining position paper. The most important practical tool is to ensure that timely and detailed feedback is provided to the Commissioner of Mines. This feedback should include a stipulation that before any prospecting license is granted the applicant should provide a detailed EIA that explains any potential impact, from either prospecting activities as well as potential mining activities, on the values and attributes for which the Namib Sand Sea is nominated. These EIAs should not be proforma documents as is the case with explanations for the geological context for applications, but should be carried out by recognized EIA specialists familiar with the Namib Sand Sea and the mineral exploration methodology that will be followed. Furthermore, any applicant should be formally advised via the Commissioner of Mines that a detailed EMP will have to be approved by the Environmental Commissioner before any entry permit is granted by the MET for prospecting purposes. The costs of monitoring compliance with the EMP provisions should be for the account of the prospector. A daily ‘park user fee’ mechanism as is applicable for the filming industry should be formally regulated for prospecting and mining in protected areas. Formal regulations in that respect need to be drafted and published under the relevant Nature Conservation Ordinance (1975), Minerals (Prospecting and Mining) Act (2003) and Environmental Management Act (2007).

Actions	Monitoring	Output
1. Establish a library of all the relevant EIA reports, EMPs and Records of Decision regarding EPLs and Mining Licences	Library catalogue or updates to be provided annually to all relevant warden offices	Improved information and understanding of EIA contents and EMP requirements
2. Implement a “prospecting and mining monitoring sheet” that enables rapid EMP compliance monitoring.	All rangers and wardens trained in monitoring EMP compliance	Transparent monitoring of environmental awareness
3. Develop recommendations on license applications in line with values, attributes and zonation of the Namib Sand Sea	Basic requirements available for rapid response to license application that can be	Improved communication with the Commissioner of Mines

	augmented by additional information	
4. Develop address list for team of experts to provide input for responding to license applications	Informed factual response to license applications	Greater awareness of aspects that may be impacted by prospecting and mining
5. Seek cabinet approval for park specific prospecting and mining user fees and requirements for park entry by prospectors	Cabinet submission on user fees	Gazetted user fee schedule

2.6 TOPNAAR INDIGENOUS COMMUNITY

The indigenous Topnaar or \ne Aonin Nama community lives along the Kuiseb River in about 18 farming settlements from Rooibank to Homeb under their traditional leader Chief Seth Kooitjie. Most of the permanent residents are pensioners and young children with youth and working age community members attending school or working in the coastal towns. The number of homesteads and settlements and total population along the river vary according to opportunities for income, environmental conditions, and other socio-economic factors. The Topnaar community practice subsistence farming by raising livestock and limited garden horticulture along specific stretches of the Kuiseb River resulting in relatively intense use of vegetation and natural plant resources in the river and immediate adjacent areas. Livestock grazing is mainly restricted to the riverbed and riverbanks as the sand dunes to the south and the gravel plains to the north do not offer any significant amounts of fodder, though donkeys and horses may range several kilometres away from the river. The primary source of fodder for livestock is pods and leaves from trees such as *Faidherbia albida* (Ana tree), *Acacia erioloba* (Camel thorn) and *Euclea undulata* (False ebony) in the riverine forest along the Kuiseb. *Welwitschia mirabilis* on the plains is a particular target for horses during dry times. The Topnaar farmers experience problems when flood events wash away the pods and prevent animals from browsing in the river. Gardens are usually small except where approved development projects attempt more intensive production (e.g. at Homeb). The Topnaar also had a traditional cultural practice of seasonal harvesting of !nara melons (*Acanthosicyos horridus*) where specific !nara plants or fields were traditionally owned by individual families that ensured sustainable harvesting. This has recently transformed into an open access system where everyone is in competition for the !nara fruits following commercialization of the resource, a loss in traditional cultural values related to !nara and the wage and social benefit dependence of community members.

There are no reliable statistics on the numbers of livestock belonging to the Topnaar, with the most recent estimate suggesting around 200 cattle, 2,500 goats, 120 donkeys and 50 sheep. Livestock is primarily kept for cultural purposes rather than to maximize production for marketing, thus livestock is only sold when there is an immediate need for money. The small stock is of indigenous breeds and large stock is commonly a mix of European breeds and indigenous Sanga cattle. Donkeys are kept for transport purposes. Water for the livestock and settlements was traditionally obtained from hand dug wells in Kuiseb riverbed but more recently these were replaced by boreholes or taps on the pipeline. These are provided by government and water users are expected to pay for the cost of access to water where NamWater provides water from its pipelines, or to maintain boreholes, established by the Ministry of Agriculture, Water and Forestry, through local Water Point Committees.

Community relations along the Kuiseb are a sensitive issue that are continuously evolving to balance conservation requirements with community aspirations. They also require close co-operation with various Ministries responsible for different aspects related to the community including agriculture, environment, lands, education, health and local government. Various agreements have been negotiated between the Ministry of Environment and Tourism and the traditional authority. These include access to tourism opportunities through the allocation of concessions, an annual wildlife utilization quota, and accepting the need for the Topnaar community to continue their traditional subsistence and lifestyle practices within the context of national development. The Kuiseb Basin Management Committee (KBMC) plans to establish an Agricultural Working Group consisting of members with appropriate expertise that will identify which knowledge and strategies are needed to manage those issues. Formal mechanisms for collaboration with other ministries still need to be formulated to meet various aspects of development relating to the Topnaar community.

Actions	Monitoring	Output
1. Establish a livestock census and monitoring system in collaboration with the MAWF, KBMC and local Water Point Committees	Approved livestock census and monitoring system	Accurate annual livestock estimates per settlement
2. Develop an inter-Ministerial Topnaar development forum through consultation with the traditional leadership	Consult Chief Kooitjie and MRLGHRD	Improved community development coordination
3. Assist Topnaar Tourism Concession endeavour as appropriate	Concessions Unit reports	Opportunities for Topnaar to participate in tourism industry
4. Facilitate annual wildlife utilization quota to Topnaar Traditional Authority for distribution of wildlife products to community members	MoF exemptions of wildlife assets and community records of game product distribution	Wildlife resource benefits to community
5. Document and re-invigorate traditional resource and cultural landscape management systems in consultation with Traditional Authority and Directorate of National Heritage MYNSSC	Traditional Authority resource management system	Potential inclusion of cultural values in World Heritage extension

2.7 LOCAL AND REGIONAL DEVELOPMENT

The large dunes and continuously shifting sands of the dune sea pose a major challenge to infrastructure and economic development. However, the municipal area of Walvis Bay with its port and an approximate population of 70,000 inhabitants is immediately to the north of the area, the much smaller Lüderitz port to the south, and a high growth tourism area along the eastern boundary. Walvis Bay is of specific significance as the age structure of its population suggests substantial migration into Walvis Bay responding to socioeconomic development drivers. It is Namibia's primary port and a major gateway for landlocked countries in Southern Africa such as Botswana, Zimbabwe and Zambia through the Walvis Bay Corridor. It is actively promoted as a Hub Port for Southern Africa as it is the only major harbour between Angola and South Africa and has excellent infrastructure in terms of tarred roads, railways, airports, communications and electricity. Strategic initiatives such as the Walvis Bay Export Processing Zone (EPZ), dry port

allocations to neighbouring countries and the deepening and expansion of the port facilities indicate the relative importance of Walvis Bay. Apart from its deep sea port, Walvis Bay is also the centre of Namibia's fishing industry, has a growing tourism industry, a growing manufacturing industry and a variety of relatively small-scale mining concerns such as salt mining, guano harvesting and dimension stone.

Revenue from fisheries is the second most important foreign exchange earner in Namibia after mining with annual fish catches averaging around 572,460 tonnes and employing around 13,400 people annually. Infrastructure for the fishing industry is shared between Lüderitz and Walvis Bay. Lüderitz primarily caters for rock lobster whereas Walvis Bay has on-shore fish processing factories. Furthermore, most of the future diamond mining industry of Namibia, which is the largest foreign exchange earner for the country, will be located offshore and serviced through Lüderitz. Most of the imports and exports of other mines in Namibia flows through Walvis Bay. Local salt and dimension stone mining areas at Walvis Bay are relatively small but major local industries. In addition, around 30 tourism establishments are located in Walvis Bay that are mainly focused on Walvis Bay lagoon, Sandwich Harbour, adventure tourism in the Kuiseb Delta dunes and Walvis Bay-Swakopmund dune corridor and other local attractions.

The overview shows that Walvis Bay will remain an important economic development area. Accelerated economic development will introduce a variety of environmental risks and an increased demand for water. The Walvis Bay municipality has an environmental officer and environmental management plan to guide development, though the effects of development may pose new challenges to conservation. For example, many of the cultural sites close to Walvis Bay are threatened by uncontrolled tourism and recreational use of the dune fields, while expansion of commercial activities may destroy specific sites. Though larger developments in Namibia are generally guided by questions regarding sustainability and the precautionary principle, the immediate and cumulative impacts of smaller local developments are often not taken into account.

Special attention should therefore be given to all kinds of development initiatives within the Namib Sand Sea and its buffer zone to ensure the integrity of the values and attributes of the World Heritage site is respected. Economic exploitation by entrepreneurs usually focuses on short-term economic returns at point locations. Nevertheless, concern for ecosystem and landscape conservation is often reflected in the EIAs their consultants may carry out. Clarity on the values, ecological processes, case studies of sustainable practices, improved public knowledge and stringent application of the precautionary principle may assist towards a more sustainable development culture. All development should be carried out in an environmentally sensitive manner according to best available practices as required by national law, international standards and sound environmental management principles and ethics. However, threats and impacts from inappropriate development often appear much faster than the ability of official regulatory mechanisms to respond. Thus oversight by management staff is critical to provide early information on perceived threats, on monitoring impacts through the event book system, and to ensure that environmental sensitivity principles are adhered to.

The active collaboration and involvement of developers (other ministries and parastatals, entrepreneurs, local communities, business operators and visitors) should be encouraged to facilitate innovation to create the lightest possible development "footprint" and to ensure ecosystem and landscape integrity (see *2.1 Landscape Management* above). That would require developing a list of priority issues related to development (e.g. road development, power line and pipeline routes, ICT, water, waste disposal, educational and health centres, tourism activities, disaster planning), identification of the essential stakeholders, proper representation of the MET on various planning committees and the systematic development of specific guidelines or policies that are communicated and implemented by stakeholders. Those issues should be incorporated into a more comprehensive development approach by evolving appropriate procedures for

environmental impact assessments (EIAs) and strategic assessments to support long-term development.

Actions	Monitoring	Output
1. Ensure all conservation staff are familiar with legal, best practice and oversight procedures on EIAs, EMPs and strategic assessments	Refresher EIA courses for management staff	Improved monitoring and compliance with EIA regulations
2. Record of any construction or development activity, management interventions, and observed environmental impact	Incident books and quarterly reports	Annual analysis of local development issues
3. Identify priority local development issues and develop specific guidelines and policies in consultation with stakeholders	Prioritised list of development issues	Best practice guidelines for small development issues
4. Environmental Commissioner implement specific procedures for EIAs appropriate to World Heritage sites	Environmental Management Act regulations pertaining to World Heritage	EIA practitioner attention to World Heritage site values and attributes

2.8 ECOSYSTEM CONSERVATION

The short and long-term variability common to hyper-arid deserts worldwide requires large areas with open landscapes to facilitate movement. The comprehensive diversity, of habitats, communities of plants and animals and keystone species, ensures ecosystem functioning and associated evolutionary processes. Management intervention should therefore be minimal with a largely hands-off approach to active intervention, especially as “patchiness” and variability in ecosystem productivity will result in variable carrying capacity over time that may be mistakenly considered to be the result of over use. Active management interventions should aim to ensure that specific components of the system such as areas close to water points are not over utilized, taking into account the ability of desert organisms to extend their ranges considerably in response to prevailing conditions. On-going monitoring of the ecology through estimates of the diversity and abundance of plants and animals through scheduled counts as well as the incident-book system is an essential component to inform annual planning. Sustained long-term monitoring of key indicators is also important as it reflects the effectiveness of the conservation effort and will guide reviews of management plans. Within the desert ecosystem, long-term monitoring is of additional significance as it also advises which short-term activities may be fruitless e.g. provision of emergency supplementary feed or re-introduction of species.

Actions	Monitoring	Output
1. Provide a baseline ecosystem map to all relevant conservation offices and ranger stations as well as tourist information centres	Use of ecosystem terminology in incident books and quarterly reports	Improved understanding of ecosystem processes and the Namib Sand Sea environment
2. Progressively improve the ecosystem map through georeferencing key habitats, breeding areas and refuges, particularly in zones where utilization is allowed (conservation staff)	Annual review of state of the environment	Regular updates of the ecosystem map to reflect improved knowledge

3. Record natural disasters, management interventions, and environmental response	Incident books and quarterly reports	Site specific cumulative knowledge of the area
4. Install notice boards at ranger stations that reflect monitoring results	Quarterly and annual reports on monitoring results	Readily available information indicating medium term environmental trends
5. Compile, interpret and disseminate key monitoring data to inform adaptive management	Annual State of the Environment report	Understanding and appreciation of the purpose of monitoring

2.9 SITES OF SPECIAL CONSERVATION AND SCIENTIFIC INTEREST

The large expanses of relatively homogenous habitats comprising the Namib Sand Sea ecosystems are punctuated by sites that are of special significance to the ecological processes and qualities of the Namib Sand Sea. Considerable information about some of these sites is available in the scientific literature and research reports, but has not yet been compiled into a readily accessible information system. Examples include:

- **Outstanding ecologically important sites** contribute significantly to the overall biodiversity and primary productivity in the area, consisting of distinct habitats such as concentrations of *Salvadora persica*, *!nara* copses, *Acacia erioloba* woodlands, natural springs, the reed beds at Sandwich Harbour, inselbergs, isolated rocky outcrops in the interior and along the coast, isolated *Acacia erioloba* trees and communal weaver nests.
- **Breeding sites or areas** that maintain colonies of specific species of exceptional conservation importance such as vulture and raptor breeding sites, regular stopovers of migratory birds, Damara tern nesting areas, cormorant and penguin nesting areas, regularly used hyena den areas.
- **Aesthetic sites** that are of exceptional beauty and embody the special attributes for which the Namib sand Sea is nominated such as specific viewpoints and their vistas, e.g. Dune 45, Dead Vlei, Sossus Vlei, inselbergs.
- **Exceptional outliers** that represents isolated patches of habitat which are unusual and rare in Namib Sand Sea and often inhabited by relict populations of species such as inselbergs surrounded by dunes, natural springs, isolated rocky outcrops near the coast, lichen fields.
- **Scientific Information sites** that allow reconstruction of the geological, ecological and cultural past of the area such as sediment remains from floods, pan edges, archaeological scatters and sites, fossil sites
- **Historical sites** that reflect past human endeavour where abandoned human infrastructure or constructs are found such as the Eduard Bohlen wreck, the Charlottenfelder, Fischersbrunn, Grillenberger and Holsatia abandoned mining and exploration camps as well as the industrial and transport debris scattered all over abandoned mining areas.
- **Generically protected occurrences** that are legally protected regardless of where they occur such as any fossils, meteorites, archaeological artefacts and deposits, shipwrecks and rock art.

All such sites are usually point locations that are easily disturbed or destroyed through ill-guided and inadvertent ‘tourism’ or overutilization as popular destinations. Adequate protection and management require exact locations that are not available at present and that would require considerable effort if developed through data mining. Such sites require better protection and focussed monitoring but first require proper recording of sites through georeferenced information and a photographic record. In general, most of these sites need to

be closely monitored and in many cases excluded from close approach by any tourists or other users, except by recognized scientists with appropriate permits and accompanying conservation staff.

Actions	Monitoring	Output
1. Progressively develop a georeferenced database of SSCSIs	Incident books and research reports, Gobabeb Centre database	Special maps showing categories of Sites of Special Conservation or Scientific Interest
2. Prioritize the evaluation and monitoring of the most popular SSCSIs through baseline surveys	State of Conservation reports on most important sites	Focussed monitoring of tourism exploitation of sites
3. Require research scientists to submit georeferenced site reports, including extracts from past research	Catalogues of sites georeferenced by scientists	Progressive data mining for SSCSIs
4. Apply the Incident Book system with support from concession holders to improve and expand georeferenced SSCSI records	Incident books and concessionaire reports	Progressive data recording of SSCSIs
5. Ensure that georeferenced site information and classification is readily available for inclusion into GIS systems	Availability of GIS shape files through NNF's Environmental Information System (EIS)	Greater awareness of concentrations and occurrences of sensitive sites
6. Develop and distribute public information about each category of site	Public information products such as posters, pamphlets and information boards	Public awareness of importance and sensitivity of particular sites and areas

2.10 WILDLIFE MANAGEMENT

The rich diversity of indigenous wildlife is a key attraction for visitors and enhances the beauty and starkness of the landscape, e.g. the iconic photographs of an oryx or gemsbok posing in front of a massive dune or zebra in the gramadulla landscapes. However, the variability of the environment from unpredictable rainfall has a considerable effect on the condition and numbers of wildlife. Game population numbers should be allowed to fluctuate naturally through migration and natural mortality adapting to appropriate biomass for particular species and for the total wildlife population under different rainfall and range conditions. Minor fluctuations in numbers and condition of species should be explained to visitors through information centres. Poor condition and mass mortalities of flagship species during drought conditions are natural phenomena, but undue criticism and concern by visitors about starving wildlife during droughts in high traffic areas such as the Sossus Vlei corridor may occasionally require management intervention to reduce population numbers. Mass mortalities during droughts may be ameliorated to some degree by establishing open systems, particularly for west-east migration. However, population numbers of a particular species will not be allowed to adversely affect the long-term population stability of other species. Active measures for consumptive utilization and to reduce population numbers, whether game capture or offtake to reduce populations or fulfil directives for community quotas, should be carried out in designated areas away from well-frequented tourist areas. Such management measures shall be informed through monitoring of population trends (age and sex structures and body condition) and distribution of populations related to rainfall and

grazing conditions. An adaptive management approach of minimum intervention, managing water availability, and sustainable use is already practiced and will continue. Where practically feasible, some species that were formerly resident in the area will be re-introduced but not species that were likely to be relicts, migrants or vagrants.

Actions	Monitoring	Output
1. Improve integration of monitoring of rainfall, veld condition and wildlife observations (numbers, age & sex classes and condition) into incident book system	Standardized monitoring record format	Annual wildlife status reports
2. Require annual refresher training on Namib Sand Sea ecosystem functioning	Regular courses attended by NNP and senior management staff at Gobabeb Centre	Informed decision makers and conservation staff
3. Update and improve policies and procedures on consumptive utilization and emergency offtake	NNP wildlife utilization policy	Transparent procedures for wildlife population management
4. Develop checklist of actions and likely ecological consequences as a practical 'legacy' conservation decision-making tool	List of possible actions and likely consequences of management action	'Legacy' management reference and decision-making tool
5. Undertake focused monitoring of flagship species at point locations	Regular point location monitoring of wildlife	Point location monitoring data to compare to aerial census information
6. Manage and interpret monitoring data and intervention results	Database on wildlife population numbers from aerial census, point location monitoring and incident books	Long-term wildlife population trend and fluctuation information

2.11 ALIEN (EXOTIC) SPECIES

The absence of viable populations of alien species within the Namib Sand Sea is an indicator of the pristine condition of the ecological system. Non-invasive alien species are justifiable where no viable indigenous alternative are available for the physical, economic and spiritual well-being of residents and visitors to the property, but should not be introduced simply to satisfy the whims and expectations of uninformed entrepreneurs, tourism operators or visitors (e.g. palm trees, cactus, camels, exotic game are inappropriate). Clear, non-discriminatory guidelines on pets and domestic animals for resident staff should be distributed and applied to conservation management staff as well as those of SOE and private tourism establishments. Feral populations of alien species shall be monitored and eradicated where feasible before they become permanent populations or before they affect the integrity of the ecosystem or population dynamics of some species.

Actions	Monitoring	Output
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1. Maintain programme to monitor and opportunistically eradicate undesirable and feral populations of alien species	Incident books and activity reports	Preventative management of alien organisms
2. Review and distribute guidelines on pets, garden plants, and domestic animal to staff, concessionaires, entrepreneurs and tourism operators	Clear guidelines on pets, garden plants and domestic animals at all residences	Clear understanding of reasons for restrictions
3. Develop and distribute information products on the threats posed by alien invasives, including inadvertent 'hitchhikers', to inform visitors and staff	Awareness products on alien invasives in desert environments	Public cooperation in reducing risk

2.12 FENCES

Fences are currently largely absent from the Namib Sand Sea. The management plan is based on open systems for the largest possible continuous landscapes, thus new fences shall not be approved except where they have strategic value (e.g. short-term holding areas or enclosures for research monitoring or wildlife management). The eastern boundary of the buffer zone is demarcated by a fence originally constructed to reduce friction with neighbours of the conservation area. It defined the boundary, prevented valuable free-ranging animals from straying and restricted potentially destructive wildlife to the park. The historic reasons for the fence was largely met and have since disappeared, thus the fence has become quite permeable. It recently became a contentious issue with some neighbours that would like to have the fence removed. It is, however, a valuable state asset and thus any intentional breaching or removal of the fence should follow procedures for the disposal of state assets. Existing fences shall not be maintained except where neighbouring land use is a threat or where secure fencing is essential for good neighbourliness.

Actions	Monitoring	Output
1. Develop clear guidelines on the requirements for approval of fences to guide planning by concessionaires, tourism operators and staff	Guidelines on fences in the Namib Sand Sea	Few fences and unrestricted wildlife movement
2. Ensure signage for areas with frequent vehicle traffic on the potential risks posed by free-ranging wildlife	Traffic accident register, appropriate signage	Vehicle operator awareness
3. Patrol and maintain fences required for wildlife management as needed	Staff activity reports	Appropriate fence maintenance
4. Evaluate need for intentional breaching or removal of selected parts of the eastern boundary fence	Report on need and condition of boundary fence	Addressing neighbour concerns
5. Where appropriate, initiate procedures for breaching or removal of fences in terms of state asset control procedures	Formal approvals for fence removal	Increased permeability at choke points

2.13 WATER POINT MANAGEMENT

The Namib Sand Sea is virtually devoid of naturally occurring perennial water. The few springs in remote areas are either seasonal or not easily accessed. They are outside the range of most large mammals, are especially sensitive to disturbance and often surrounded by largely unresearched archaeological sites. Where temporary pools develop after floods or thunderstorms, open water is subject to high evaporation rates, high demand by wildlife and rapid deterioration of water quality. Any artificial water points are subjected to the same pressures as well as a range of long-term ecological effects at such locations. Inadvertent water point establishment, through ecotourism development with water points to attract game or poorly planned wastewater facilities, also needs to be taken into account. Ecological consequences when establishing water points or wastewater facilities may cover a range of aspects. The effect of trampling and habitat degradation in the vicinity of water points is well known. Water points are also renowned for their importance to predators, thus desert species are particularly sensitive to movement at water points. The ecological costs for an individual travelling to water in the desert are high, thus the effect of disturbance should not be underestimated. The physiological and behavioural adaptations that allow desert species to survive in the absence of free water may deteriorate through regular access to water, leading to smaller ranges and increased mortality during periods of drought. Water point development therefore needs to be planned for strategic management of wildlife populations. Planning should not only include aspects of management and maintenance but also the need to monitor its ecological consequences.

Actions	Monitoring	Output
1. Maintain a map and inventory of all natural and artificial water points with related attributes such as yield, depth and surface area (including lasting temporary ponds and sumps)	Water resource map and database at all ranger stations	Continued water resource management
2. Continue maintenance and cleaning of water points, including monitoring of condition and quality of resources around water points	Activity reports, incident book system	Continued water resource management
3. Develop guidelines on the selection, establishment and ecological monitoring of new water points and waste water disposal	Guidelines on water point establishment and waste water planning	Clear guidelines on water supply management
4. Develop information materials on the adaptations of desert organisms to water scarcity and the effect of excess water	Information posters, visitor behaviour guidelines	Improved sensitivity to the importance of water

2.14 COASTAL MANAGEMENT

The intertidal coastal zone, its biota and the species that transcend the marine/terrestrial interface are managed jointly by MET and MFMR staff under agreed co-management principles and protocols that promote synergy, efficiency and elevated conservation management, monitoring and protection of habitats, processes and species. This mutually supportive working environment is based on regular consultations between MET and MFMR management staff. This allows for the identification of key areas, issues and species that require joint monitoring and management. It also developed operational principles, procedures and protocols for monitoring, managing and

reporting on the areas and biota of mutual interest, as well as means of collaboration, communication and mutual support.

Actions	Monitoring	Output
1. Continue liaison and discussions between MET and MFMR regional managers	Co-management agreements	Effective costal management
2. Continue collaboration, communication and reporting for identified priority areas and species at the operational level	Activity reports, incident book system	Effective costal management
3. Continue improvement of co-management approaches to ecosystem management and monitoring	Monitoring results	Effective costal management

2.15 ROADS

The Namib Sand Sea itself has few roads and tracks though it is surrounded by a well-established road network. The most important road is the tarred road leading to Sossus Vlei. Maintaining the existing road and track network is an important aspect of effective tourism management. A number of well-established tracks used by management and research staff link important points within the area. Concession holders are restricted to defined tracks where feasible, and elsewhere to travel corridors where mobile dunes will rapidly cover tracks. This road and track network is essential for management (including monitoring and research) and tourism in such a large area. The track network is being monitored and closed when necessary to allow natural rehabilitation. New roads are rarely developed and only permitted to ease vehicle traffic and visitor pressures, in which case the roadway and likely borrow pits are subject to EIAs. No off-road driving is allowed except in areas clearly designated and zoned for this purpose, e.g. concession routes, or when essential for management purposes. Off-road driving along concession routes is under the supervision and guidance of tour guides experienced in desert driving, but that will benefit from improved knowledge of the ecosystem in which they operate. It is currently presumed that off-road driving on mobile sand dune belts has little long-term impact, though some reports indicate that especially scarring of dune crests may persist for long periods and may even result in blow-outs and a change in dune structure. More information is required on those aspects, including the most appropriate vehicle types and tyre sizes.

Actions	Monitoring	Output
1. Maintain an accurate GIS-based map of roads and tracks, including decommissioned and rehabilitated tracks	Each ranger/warden station and suitable park GPS should have track network map	Maintaining knowledge about suitable routes
2. Subject any new roads and borrow pits to an EIA that will also consider the values for the world heritage nomination	Chief warden to maintain file of EIA recommendations	Maintaining world heritage values
3. Carry out specific planning to consider refurbishing existing roads, especially to ameliorate persisting dust in the Sesriem area, in consultation with MWT and NPC	Road development plan and schedule with Chief Control Warden	Improving road access and ameliorating negative impact
4. Develop a monitoring plan for tourist	Georeferenced incident	Monitoring report

concession routes to determine the effect of off-road vehicles on dune morphology	book records, annual monitoring results	produced by 2017
5. Develop guidelines on road and track signage that will contribute and explain the attributes for world heritage nomination	Guidelines on appropriate sign technology, size and positioning	Improved visitor guidance and experience
6. Develop training course, testing and registration system for professional off-road drivers and guides along concession routes	Development of driver guidelines and testing system, course registrations	All concession holders to have registered drivers by 2014.

2.16 RESTORATION

One aspect of adaptive management is to ensure that landscapes and ecological conditions may return to their natural condition after disasters or inappropriate human activity. The natural processes in many parts of the desert environment are very slow, which may seem to advocate intervention. In some cases, e.g. relatively recent and limited point impacts, immediate action may be appropriate. In some other cases, e.g. perceived ‘unnecessary’ evidence of human occupation, abandoned roads, or large exploited areas, intentional rehabilitation may be inadvisable or even illegal. Some despoiled areas and human debris have become tourist attractions, while well-intentioned recent ‘restoration’ activities have destroyed important historical information through ignorance. Evidence at various places also indicates that natural restoration processes in the Namib varies from rapid to slow, depending primarily on differences in the stability and type of substrate, degree of geomorphological activity and weather conditions. Site or area rehabilitation is not an aspect that should be undertaken as a matter of course but needs to be carefully evaluated based on technical considerations, restoration ecology, manpower and time implications, cost and impact on the values of the property. Any rehabilitation project should also include a monitoring and evaluation component to ensure better understanding of restoration ecology in the Namib Sand Sea.

Actions	Monitoring	Output
1. Develop georeferenced database of rehabilitated sites, abandoned areas exposed to natural processes, and restoration techniques	Incident book records and activity reports	Record of rehabilitation activities
2. Develop and implement guidelines for spot rehabilitation	Incident book records and activity reports	Record of rehabilitation activities
3. Develop procedures for planning, consulting, evaluation and approval of site restoration projects (similar to EIA procedures)	Restoration protocols	Oversight on restoration proposals
4. Identify priorities of man-made structures detracting from the integrity of the area that may require restoration	Classification and list of restoration priorities	Planned restoration

2.17 LAW ENFORCEMENT

Unlawful activities, such as illegal use of wildlife and other natural resources as well as visitor transgressions of regulations intended to minimize impacts on the ecosystems, are currently rare. The safety and security of visitors and staff is a priority to tourism establishments in the area, which contributes to the low incidence of illegal activities. Effective law enforcement patrols and surveillance by conservation staff further contributes to maintaining a zero tolerance approach to illegal acts. The focus of a programme of law enforcement is to maintain compliance with regulations and laws, primarily through forward planning of activities, monitoring for early identification of emerging problems, information distribution, and effective collaboration with other law enforcement agencies such as MFMR staff, the Namibian Police and Ministry of Justice officials. The established radio network allows rapid response to any kind of crises by management staff, while the special training they receive in law enforcement procedures ensures effective prosecution of transgressors. Maintaining and improving the effectiveness of the current system allows staff to focus on other management priorities

Actions	Monitoring	Output
1. Maintain an effective communication system	Annual inspections and reports on communication system	Rapid communication
2. Improve reporting system on law enforcement activities and observations to include nil results	Incident book system and transgression statistics	Focused law enforcement activities
3. Exploit the “rumour mill” to escalate the severity and degree of law enforcement activities	Transgression statistics	Improved compliance with regulations
4. Develop incentives to improve cooperation with other law enforcement agencies and other parks to increase law enforcement monitoring	Operational plan and number of exchange visits by peace officers	Improved compliance with regulations
5. Undertake regular evaluation of law enforcement courses and licensing of honorary rangers as peace officers	Annual number of courses and attendance statistics	Improved enforcement and monitoring capacity

2.18 HONORARY WARDENS

Current and future legislation makes provision for the appointment of Honorary Wardens to support existing staff. Sufficient staff numbers to carry out conservation-orientated work while also enforcing regulations over a large area, which is the primary purpose of appointing highly trained staff, will always be problematic. Honorary Wardens can complement execution of the management plan in a range of areas such as environmental monitoring, monitoring recreational and tourism activities, resource use, promotion and education, community business involvement and development guidance, and neighbour relations. Honorary Wardens will also allow improved collaboration between peace officers with different mandates. For example fisheries inspectors, forestry inspectors and heritage officers are peace officers with training and specific national mandates to enforce regulations in the area. Reciprocal honorary appointments after appropriate training are logical, e.g. suitably qualified MET personnel may be empowered to enforce fisheries legislation, and suitably qualified MFMR personnel to enforce environmental, park and conservation legislation. In addition, dedicated private individuals or officials with specialized skills may supplement the human resources that are available.

The criteria for the selection of Honorary Wardens should be transparent and they must receive appropriate training before they can be appointed. Training should include park regulations, law enforcement procedures, the incident book system, monitoring requirements and standards. They should be appointed for three years with specified areas of competence, renewable for further three-year terms depending on their performance and commitment. The powers and privileges of Honorary Wardens in different areas should also be clear as well as procedures for reporting and feedback. A specific conservation officer should be appointed as supervisor. It should be taken into account that volunteers and honorary staff have to be managed if they are to be used effectively:

Actions	Monitoring	Output
1. Develop fields of collaboration and terms of reference for reciprocal honorary appointments of peace officers with complementary legal mandates	Interministerial agreements	Improved law enforcement capacity
2. Develop guidelines for the identification and selection of additional Honorary Wardens, a training syllabus, and reporting and oversight procedures.	Honorary Warden operational guidelines	Transparent Honorary Warden appointment system
3. Select, train, and appoint Honorary Wardens	Honorary Warden register	Improved human resource base

2.19 MONITORING

Monitoring of a limited number of carefully selected indicators will inform judicious adaptive management, allow continuous and timely assessment of emergent or actual threats, reflect the state of the environment and improve information products for visitors. On-going observations for long-term data sets are especially important in arid environments where short-term fluctuations in vegetation primary productivity and wildlife distribution and population sizes may be extreme under rare weather conditions. As management decisions need to be based on recurrent ecological baselines the long-term data sets provide information on the environmental 'norm'. The 'boom and bust' noise of inherent variability in arid ecology may be misleading and incur pointless expense and fruitless work if adaptive management attempts to address perceived natural disasters. Long-term data sets allow for the identification of real disasters and the evaluation of the potential success of possible interventions. These long-term indicators, as well as specific indicators discussed before, are listed in Table 2.18.1 below.

Table 2.19.1. Management, environmental and ecological indicators for regular monitoring.

Indicator	Periodicity	Responsible	Location of records
<i>Management indicators</i>			
Updated planning, management and monitoring framework	5 year intervals	MET, Chief Control Warden	Office: Chief Control Warden, Gobabeb Centre
Updated detailed tourism plan	5 year intervals	MET, Director of Tourism	Office: Director of Tourism; Chief Control Warden, Gobabeb
Strategic Forum annual meetings (MET, Gobabeb, neighbours)	Annual review	Chief Control Warden	Office: Chief Control Warden, Gobabeb
Consultative Forum of	Annual	Chief Control	Office: Chief Control

interested parties for on-going operational assistance, guidance, support and feedback	review, quarterly meetings	Warden	Warden, Gobabeb
Honorary warden programme	Annual review	Chief Control Warden	Office: Chief Control Warden, Gobabeb
Community interest group activities, e.g. birds of prey	Annual review	Individual interest groups (MET review)	Office: Chief Control Warden, Gobabeb
Human use indicators			
Daily detailed tourism records (numbers, types of activities)	Monthly submission; annual review	Sesriem gate personnel, Chief Warden	Office: Chief Warden, Director of Tourism, Gobabeb, Sesriem
On-going records of concession allocations and use (numbers, types of activities)	Annual review	Chief Warden	Office: Chief Warden, Director of Tourism, Gobabeb
Water use and management (tourism & wildlife)	Annual review	Chief Warden	Office: Chief Warden, Gobabeb
Records of research activities and results	Annual review	Chief Warden; compiled by Gobabeb	Office: Chief Warden, Gobabeb
Geography indicators			
Salt pans/flats; Endorrheic pans (sensitivity 5 areas)	Annually	Chief Warden; Gobabeb	Office: Chief Warden, Gobabeb
Ephemeral rivers, inselbergs, gravel plains, rocky shore (sensitivity 4 areas)	Two year intervals	Chief Warden, Gobabeb	Office: Chief Warden, Gobabeb
Sand sea, Sandwich Harbour lagoon, eastern hills (sensitivity 3 areas)	Five year intervals	Chief Warden, Gobabeb	Office: Chief Warden, Gobabeb
Landscape aesthetics	Two year intervals	Chief Warden, Gobabeb	Office: Chief Warden, Gobabeb
Archaeological and paleontological sites	Two year intervals	Chief Warden, Gobabeb	Office: Chief Warden, Gobabeb
Daily weather and climate; Sesriem, Coast (MFMR), Gobabeb	Daily; monthly submissions; annual review	Recordings: Sesriem, MFMR, Gobabeb; Review: Chief Warden & Gobabeb	Sesriem, Gobabeb & Office Chief Warden
Hydrology and flooding as occur	Intermittent observations	Sesriem, Gobabeb; Review: Chief Warden & Gobabeb	Sesriem, Gobabeb & Office Chief Warden
Ecology indicators			
Annual and perennial vegetation population dynamics	Annually	Gobabeb with PoN for remote sensing	Gobabeb & Office Chief Warden

Invertebrate population dynamics, on-going measurements	Annual review	Gobabeb	Gobabeb & Office Chief Warden
Breeding birds of prey/vultures	Annual review	Vulture Group; Chief Warden, Gobabeb	Gobabeb & Office Chief Warden
Coastal migratory birds	Annually	CETN, Chief Warden, Gobabeb	Gobabeb & Office Chief Warden
Large mammal populations	Annually/5 year intervals	Chief Warden, Gobabeb	Gobabeb & Office Chief Warden
Invasive aliens	Annually	Chief Warden, Gobabeb	Gobabeb & Office Chief Warden

Reliable monitoring mechanisms rely on cost efficient and sustainable data collection carried out at appropriate intervals according to standardized procedures. Monitoring shall be based on existing systems that are already being used within the Park or proven elsewhere in Namibia, e.g. measuring the effectiveness of management through “Namibia’s Management Effectiveness Tracking Tool” (NAMETT). Techniques and monitoring intervals of established procedures shall only be improved or changed where it will not affect the validity and continued use of historical datasets. Some monitoring shall be outsourced to special interest groups and specialist stakeholders where special expertise is needed or where rapid recording of ‘census’ type information is required. The value of short-term data sets and information to provide context for long-term data sets is not underestimated, thus participatory monitoring and deposition of additional data sets into the archival system shall be encouraged. However, the procedures and tools to integrate, interpret and archive data at different levels (local, regional, national, global) are poor or non-existent and need to be developed. The Gobabeb Centre is a reputable and experienced research and monitoring institute specializing on the Namib and situated within the area, which makes it the logical host for collating, curating, analysing and disseminating data and information resulting from monitoring.

Actions	Monitoring	Output
1. Evaluate and judiciously improve the monitoring framework to be relevant, cost-effective and affordable	Training manual on monitoring framework	Improved monitoring
2. Ensure on-going training and reinforcement of the purpose and procedures of the monitoring framework, e.g. using the incident book system and applicable techniques	Training course records and quality of incident book records	Sustainable and reliable monitoring results
3. Develop procedures and terms of reference or a formal agreement with the Gobabeb Centre for collating, storing and interpreting of collected data together with distribution of information through reports and information products	Signed agreement in place by 2013	Reliable data analysis and information dissemination
4. Develop clear and unambiguous guidelines and advice on the purpose	Active Indicator Monitor board at each	Improved use and understanding of

and information value of each indicator to allow rapid assessment and application of information for adaptive management	ranger station	monitoring for management
5. Develop and distribute information products based on long-term data sets to ranger stations and tourist centres	Updated environmental variability information	Improved desert ecology understanding
6. Develop incentives and mechanisms to encourage tourists and require concessionaires and researchers to contribute observations and data	Data input and range of data points	Community involvement and improved access to rare observations and data from remote locations
7. Outsource monitoring tasks to specialist institutions based on formal agreements and Terms of Reference	Specialist monitoring data and reports	Reliable monitoring results

2.20 RESEARCH

The evolution of the current management approach and the large number of visitors to the area are the result of the quality of information and understanding that was generated by research. Very little of that research or the available long-term monitoring data was carried out by conservators or conservation organizations even though conservation is the main beneficiary of that research. A supportive environment to encourage scientists shall continue to benefit conservation and is integral to implementing an ecosystem approach to managing the property. This includes applied research in direct support of priority information needs (e.g. EIAs) and baseline research to improve the quality and coverage of information about the interlocking geological, ecological and socio-economic systems. The degree to which research should be prioritized has been debated all over the world without any consensus. It is envisaged that direct support or commissioning of research are likely to take place as determined by resources and urgent priorities, while most baseline research will continue to be pursued by independent visiting researchers. The Gobabeb Centre facilitates all kinds of research, though important research may take place elsewhere. It is critical, however, that information about research questions and research results are available to inform management planning and to guide the formulation of subsequent research. Active engagement of researchers will improve the availability and interpretation of monitoring information, while involvement in research by management staff shall contribute to their personal motivation, knowledge and understanding of the area. An impartial approach to support and encourage qualified researchers based on the current permit system and joint venture agreement with the Gobabeb Centre will be continued.

Actions	Monitoring	Output
1. Ensure that published and unpublished research results are accessible through the Gobabeb Centre Library (e.g. as an open and 'closed' file system)	Digital Library catalogues available to all wardens	Accessible research information
2. Ensure the annual budget makes provision for applied research by staff and <i>ad hoc</i> support to visiting researchers	Staff research programme and specialist researcher database	Sustained research interest
3. Ensure the annual budget makes	Information support	Accessible research

provision to support the maintenance of the Gobabeb Centre Library and the organizing, capturing and cross-referencing of research results	agreement	information
4. Commission priority applied or baseline research required for management planning	ToRs for priority research and research reports	Research support for adaptive management
5. Promote MET research policy, permit procedures and research opportunities to attract additional research interest	Research permit applications and reports	Sustained research interest
6. Identify exceptional research results for rapid visitor information product development	Public dissemination of high-quality research	Promotion of site values and attributes

2.21 DATA MANAGEMENT

A key aspect of management planning and adaptive decision-making is access to reliable information captured through monitoring or recorded in incident books, reports, monitoring, research and other activities. That data needs to be stored, curated and interpreted to be effective. Much of the information shall be georeferenced, time-series data that is digitally stored and organized for rapid access through ICT, some as public domain information and some sensitive information only available to registered users (e.g. rare species numbers and locations). Formal establishment of a centre to ensure the maintenance and operation of the various databases, ranging from georeferenced inventories to address lists and catalogues (photos, publications, reports, assets, etc.), is central to the process. The responsibility should rest with a facility with the experience, specific interest, and infrastructure to maintain and update a data management system, e.g. most elements are already in place at the Gobabeb Centre. It is important to note that these databases can and should be housed at different institutions as ICT access allows rapid extraction over long distances, while distribution improves archival survival. Key storage and access points should be at MET Headquarters, MET Library, Ganab, Sesriem/Zais, Gobabeb, and the National Archives. Additional data storage may occur elsewhere. It should also be noted that storage and access does not necessarily require on-line servers as the same function may be achieved by regularly updated storage devices, e.g. external hard drives.

Actions	Monitoring	Output
1. Develop an accessible and user-friendly Information System and meta database to store and manage data and information	ToRs for Information System development and contractor appointed	Data readily available to authorized users
2. Generate templates to produce annual and other periodic reports that impart key information, maps and figures	Decision on format for standardized reports	Improved access to current information
3. Ensure data security through a distributed archival system and formal agreements regarding information access	Data storage and management agreements with reputable institutions	Archival data security
4. Conclude data management agreement with the Gobabeb Centre or other experienced, dedicated stakeholder	ToRs for Information system management and contractual agreement	Sustainable data management
5. Include provision for regular updates of	Regular reports on	Improved information

website, displays, stakeholder news briefs, and standardized reports in data management agreement	different aspects include current data	dissemination to stakeholders
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2.22 AWARENESS AND PROMOTION

The Namib Desert is one of the best researched and most accessible arid areas globally. However, despite the number of popular and academic publications available to the public, information transmission is poor and mostly reliant on the efforts of visitors themselves. Visitor guides and tour operators are poorly trained and often ignorant in specific aspects relating to the Namib, while information centres at entry points and in close vicinity to popular destinations have been dismantled. Addressing the poor state of on-site information will be prioritized. Improving the quality of information to visitors shall not only add to the overall visitor experience and satisfaction, but will also assist in visitor management through self-policing by visitors. Reliable and regularly updated information shall also foster resistance to consumptive, invasive and unsustainable tourism products that will encourage tourism entrepreneurs to develop specialized ecotourism packages. Good quality information products such as displays, booklets, DVDs, websites, posters, brochures, maps, and signage can be rapidly produced to address the situation. A valuable management contribution from such products would be to engage visitors and their guides in on-going monitoring activities. It should be noted, however, that the public service system of competitive pricing often results in contracts awarded to service providers that simply regurgitate information from visitor guidebooks and dated popular publications. Part of the process should therefore be to ensure that current research results are translated into accessible information for the lay person. Improved training of tour guides at national and local levels is also required for which the engagements of training institutions such as the Gobabeb Centre, NATH and the Polytechnic of Namibia is required. Improved training of guides shall ensure that they create exceptional field experiences for tourists by sharing their knowledge in interesting and stimulating ways.

Actions	Monitoring	Output
1. Develop and open information centre at Sesriem with duplication of information products to other tourist information centres	TORs developed and contractor appointed to develop information products	Improved information on qualities of the Namib Sand Sea
2. Develop information boards, concise tourist information (pamphlets, maps) and improved signage for key destinations	Roll-out plan for improved tourist information products	Information products more widely distributed
3. Register and develop Namib Sand Sea web site with a web interface for SQL data input and access to public data	Web site established by 2013 and regularly updated	International access to information
4. Develop registration process for tour guides with associated guidelines to encourage improved guide training	Specific training courses for tour guides	More knowledgeable tour guides and better information to visitors
5. Identify kind and numbers of world heritage signage required for installation	Erection of signage at different entry points and main routes	Appropriate marketing of prospective World Heritage status
6. Develop visitor survey tools to record visitor perceptions, understanding and appreciation of the Namib Sand Sea	On-going visitor survey	Assessment of visitor experience
7. Develop an appropriate international	TORs developed and	Specific marketing of

marketing strategy in consultation with the Namibia Tourism Board	contractor appointed to develop marketing and advertising strategy	the Namib Sand Sea as a prime tourist destination
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2.23 ENVIRONMENTAL EDUCATION

The wealth of available knowledge and ready access to distinct ecosystems offers unprecedented learning experiences to visitors, scholars and schools. Aspects of astronomy, geology, geomorphology, climatology, hydrology, zoology, botany, arid-zone ecology, adaptive evolution, palaeontology, archaeology, cultural and industrial development, conservation, sustainable resource exploitation and many other fields are remarkably clear in this environment. However, effective environmental education requires dedicated staff with experience and a proven approach. The Gobabeb Centre pioneered environmental education at a range of different levels that was followed by a number of other organizations to exploit opportunities in environmental education. Attempting to duplicate the extensive experience and established educational programme of the Gobabeb Centre or the other environmental education centres in different regions around the Namib Sand Sea is unnecessary as the various programmes that are in place shall continue. The focus should therefore be to ensure a supportive environment for environmental education centres that continue to benefit conservation, primarily by encouraging and commissioning the development of appropriate educational materials, ensuring that up to date information reaches institutions, and by encouraging staff to participate in environmental education through lecturing, escorting groups and facilitating entry to popular destinations.

Actions	Monitoring	Output
1. Disseminate information products developed for visitor information centres to local schools and environmental education centres	Distribution programme	Improved environmental education on the Namib Sand Sea
2. Develop information booklet for schools and education centres on values and attributes of the property	TORs developed and contractor appointed to develop booklet	National appreciation of the values of Namib Sand Sea
3. Gobabeb Centre to maintain an address list of environmental education and information centres for dissemination of information gleaned from monitoring and research	Regular distribution of information updates	Effective information dissemination
4. Improve reduced entry fee permit process for approved environmental education and youth training programmes	Approved list of education institutions, MoF approved entry procedures	Greater accessibility for educational purposes

2.24 TRAINING

Appropriate training of management personnel is an on-going operational requirement to ensure that knowledgeable staff is in place to account for the inevitable mobility of staff through promotions, retirement, resignation or other causes as well as to effectively execute new responsibilities or operational procedures. The primary training of staff is at appropriate institutions such as the Polytechnic of Namibia or University of Namibia, supplemented through in-service training modules at their stations or specific training courses. These shall continue through the established procedures of the MET. This training, however, does not necessarily

provide the specific information or address practical challenges that may be confronted. Plans to establish a staff training facility at the Escourt ranger station, where infrastructure is in place, should be expedited to host training courses. Syllabi need to be developed for practical aspects of conservation management such as fixing and maintenance of boreholes; constructing and installing site infrastructure such as tank stands, toilets, and route indicators; maintaining solar arrays and radio communication infrastructure; practical vehicle maintenance and off-road driving skills; fire fighting and other on-site disaster management techniques; techniques and procedures for carrying out monitoring and telemetry in the Namib; office procedures such as accounting and report writing; and law enforcement courses. That training centre may also serve the training needs of all other parks in Namibia and may thus require the appointment of a permanent training officer. In addition, induction courses on the Namib Sand Sea environment and ecological processes should be fast-tracked for new staff, including how to carry out regular data gathering for indicator monitoring. The Gobabeb Centre as the envisaged data management centre, with its vast experience in desert-specific training, is the most appropriate institution for focused induction training if suitable agreements can be reached. The development of Standard Operating Procedures that can be issued to all staff for rapid consultation should be a medium-term goal of staff training and operational experience.

Actions	Monitoring	Output
1. Operationalize the Escourt Staff Training Centre	Distribution programme	Improved environmental education on the Namib Sand Sea
2. Develop syllabi and training manuals for practical in-service training on a range of topics.	Syllabi and training manuals	Improved in-service training mechanisms
3. Conclude agreement for induction training on environmental processes in the Namib Sand Sea with an appropriate institution	All new appointments undergo induction training	Operational staff familiar with values and processes of the Namib Sand Sea
4. Develop reference folder on Standard Operating Procedures that can be issued to all staff	Updatable Namib Sand Sea management manual in place	Rapid access to management procedures

2.25 ANNUAL PLANNING AND MANAGEMENT PLAN REVIEW

Effective implementation of the management plan requires annual cycles of planning for the preparation of annual work plans and budgets by operational staff. Annual work plans are the operational tools used by the staff to schedule their work, while the management plan is a medium-term planning document to ensure that the annual plans address strategic and long-term goals. This planning should be focused to exploit achievements and address limitations from the previous years, while also ensuring the scheduling of activities envisaged in the management plan and developing pro-active precautionary approaches to deal with emerging issues. Funds for implementing annual plans are released after approval of the national budget in April of each year, though the operational budget is usually known in January. Effective planning would therefore be best achieved during the first quarter of each year. Though rarely achieved, it is recommended that annual planning should be carried out in a workshop atmosphere that will allow staff to exchange ideas and recount achievements in a collegial atmosphere. The data management centre should also be represented to present the results of the monitoring process and any other important information, e.g. research and education outputs. The Chief Warden and Wardens are responsible to ensure that the management plan and annual plans are implemented and that legal requirements

regarding public finances, work scheduling and public administration are met. They should therefore jointly convene annual planning workshops and review the work of the past year. The Chief Warden, together with the higher management of the Directorate of Regional Services and Parks Management, is responsible for longer-term planning. The allocation of annual funds is guided by target sums set five years in advance through the Medium Term Expenditure Framework and annual projections of the availability of future revenue. Thus forward planning towards strategic objectives is essential as the base funding requires managers to meet identified performance targets. The Management Plan itself also needs to be thoroughly reviewed and, where necessary, revised, every five years. The next review is scheduled for 2016.

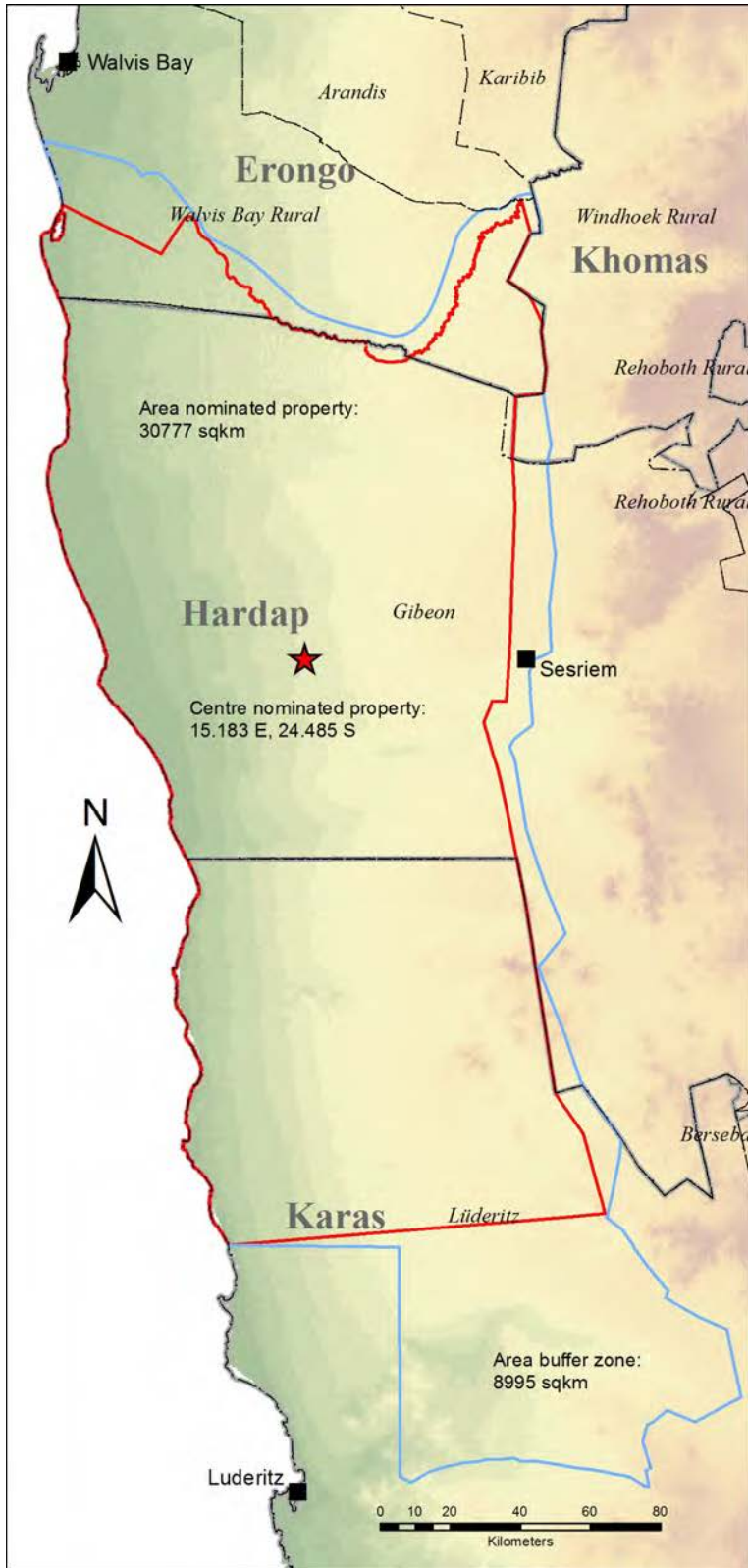
Actions	Monitoring	Output
1. Prepare annual reports by January regarding achievements, issues identified, and problems experienced during previous year	Annual reports, including analysis of monitoring data	Communication of management outcomes
2. Schedule annual planning workshop for staff during first quarter	Annual plans from workshop	Improved joint planning and work scheduling
3. Identify strategic issues to be addressed by management on on-going basis	Approved Addenda to management plan or improved guidelines or policies	Improved forward planning to address issues
4. Hold management plan review workshops in 2016 in consultation with strategic stakeholders	Revised management plan available for approval in 2017	Strategic management

Annex 2

Maps

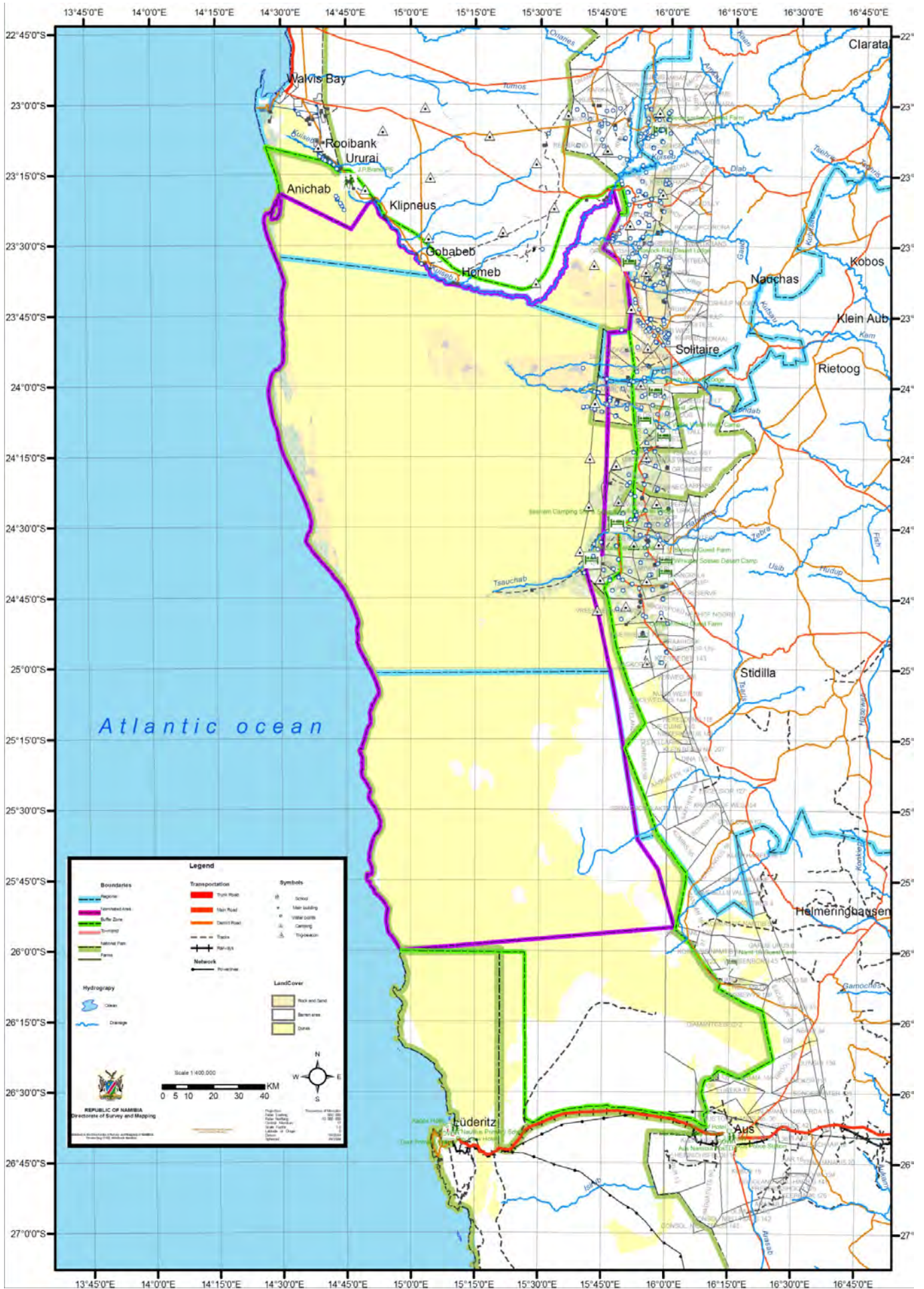


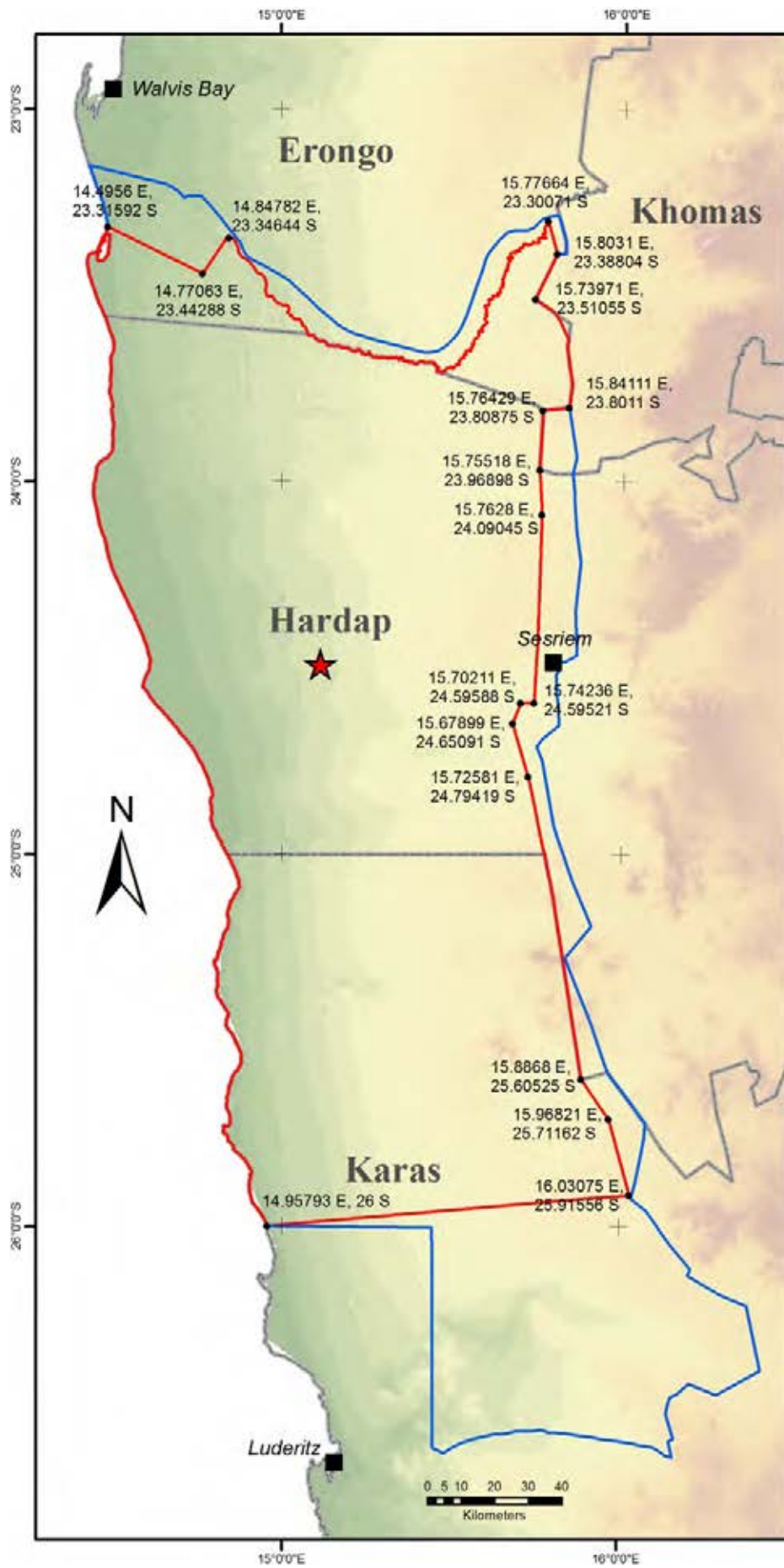
The nominated "Namib Sand Sea" within Africa and Namibia



- Nominated property
- Buffer zone
- Karas** Regional boundary and name
- Gibeon* Constituency boundary and name

Digital elevation model: Atlas of Namibia (2002);
 Satellite Imagery: ESRI Data & Maps (2004)
 Map prepared by Geological Survey of Namibia
 © Government of Namibia 2011





- Nominated property
- Buffer zone
- Coordinate of corner point
- ▭ Regional boundary

Altitude

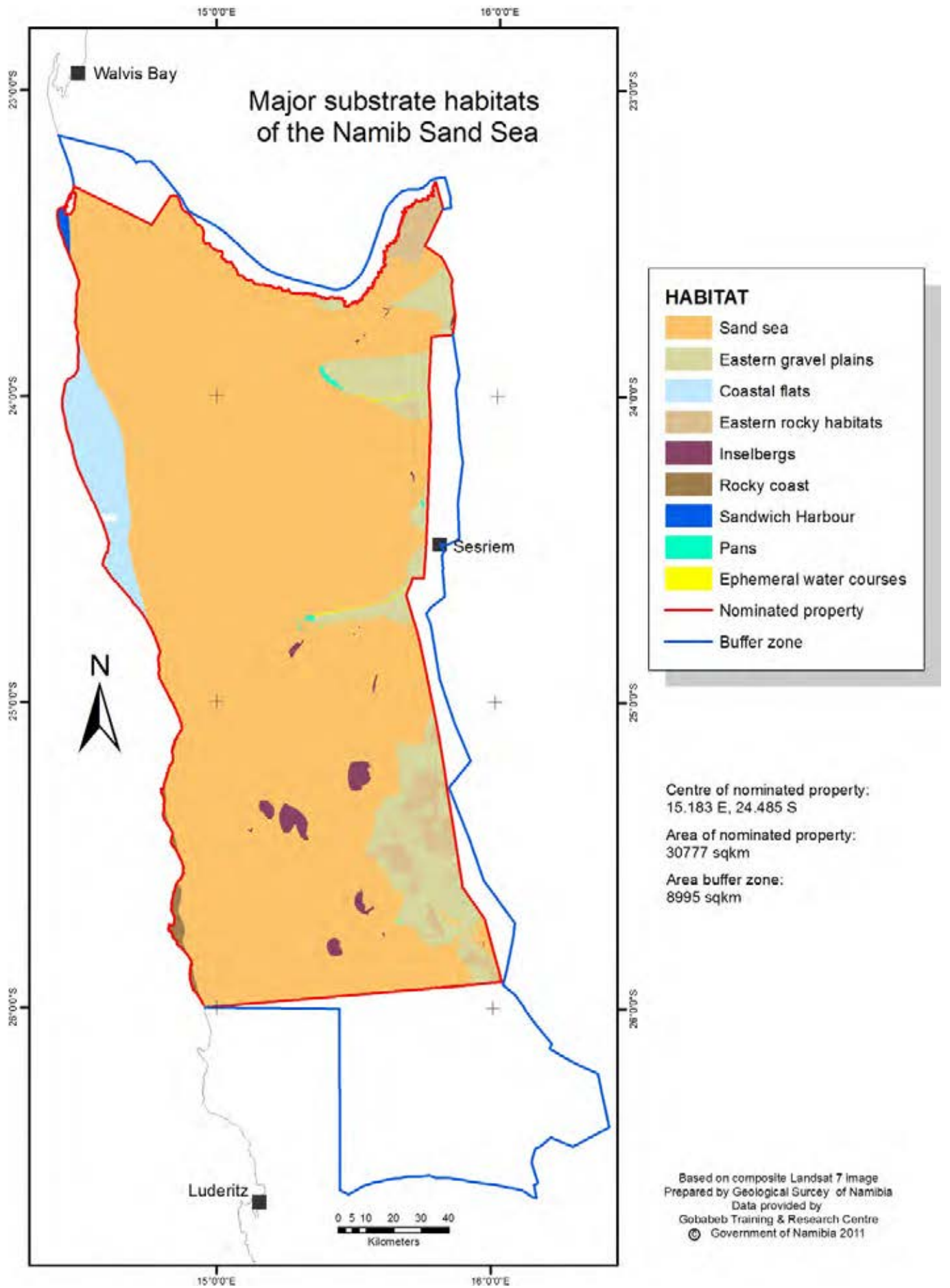
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- 100 - 199 m
- 200 - 299 m
- 300 - 399 m
- 400 - 499 m
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- 900 - 999 m
- 1000 - 1099 m
- 1100 - 1199 m
- 1200 - 1299 m
- 1300 - 1399 m
- 1400 - 1499 m
- 1500 - 1599 m
- 1600 - 1699 m
- 1700 - 1799 m
- 1800 - 1899 m
- 1900 - 1999 m
- 2000 - 2099 m
- 2100 - 2199 m
- 2200 - 2299 m
- 2300 - 2399 m
- 2400 - 2499 m
- 2500 - 2599 m

Centre of nominated property:
15.183° E, 24.485° S

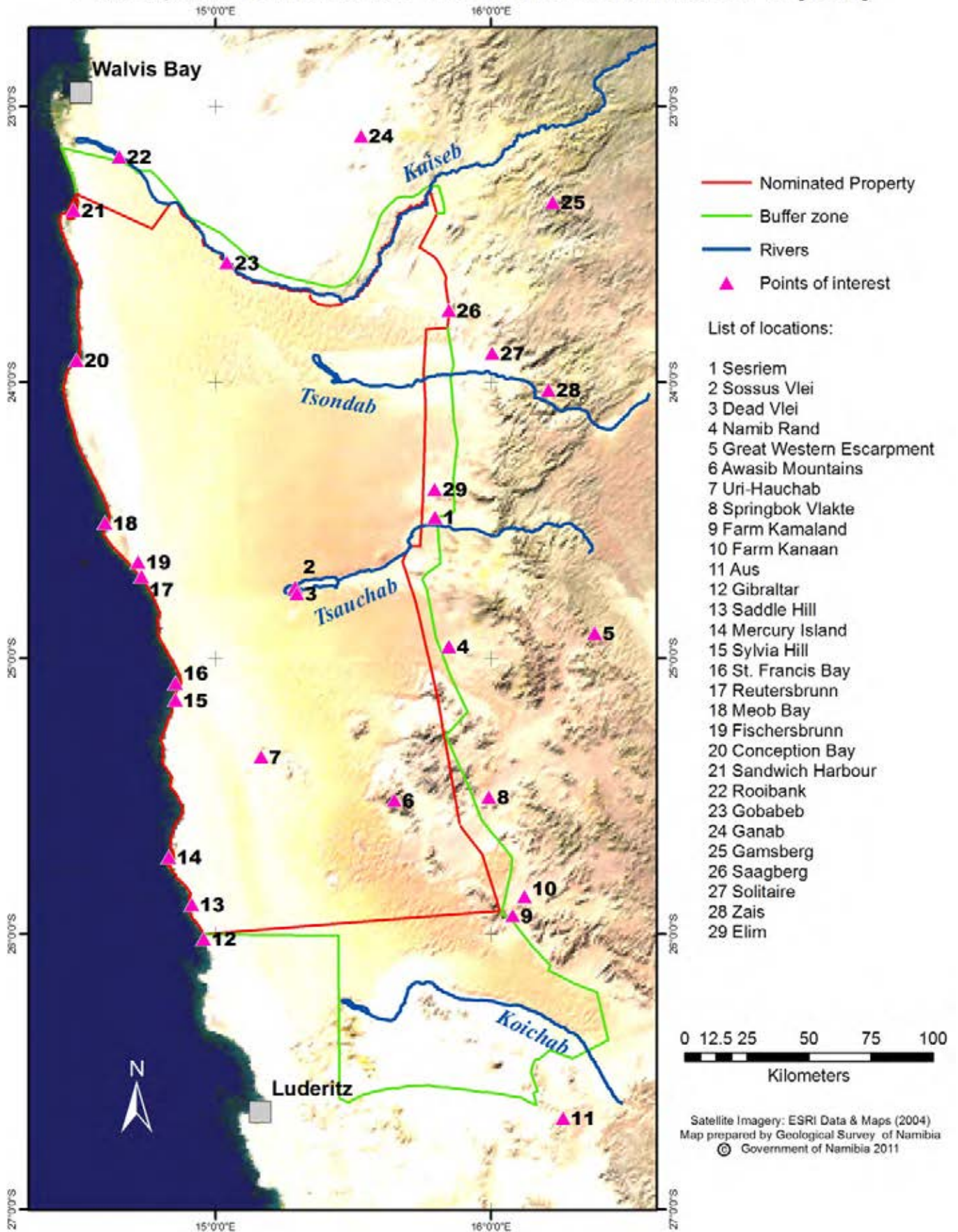
Area of nominated property:
30777 sqkm

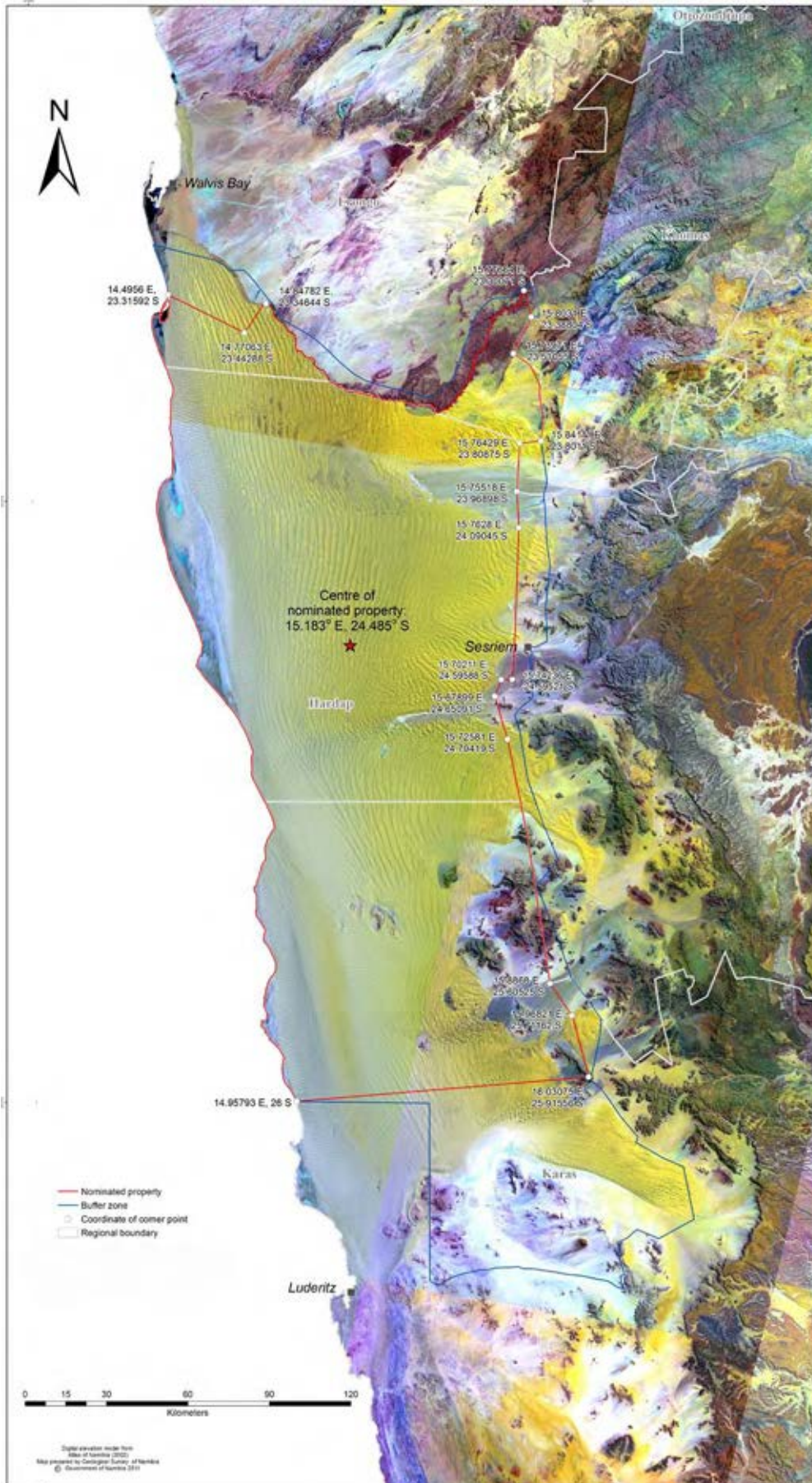
Area buffer zone:
8995 sqkm

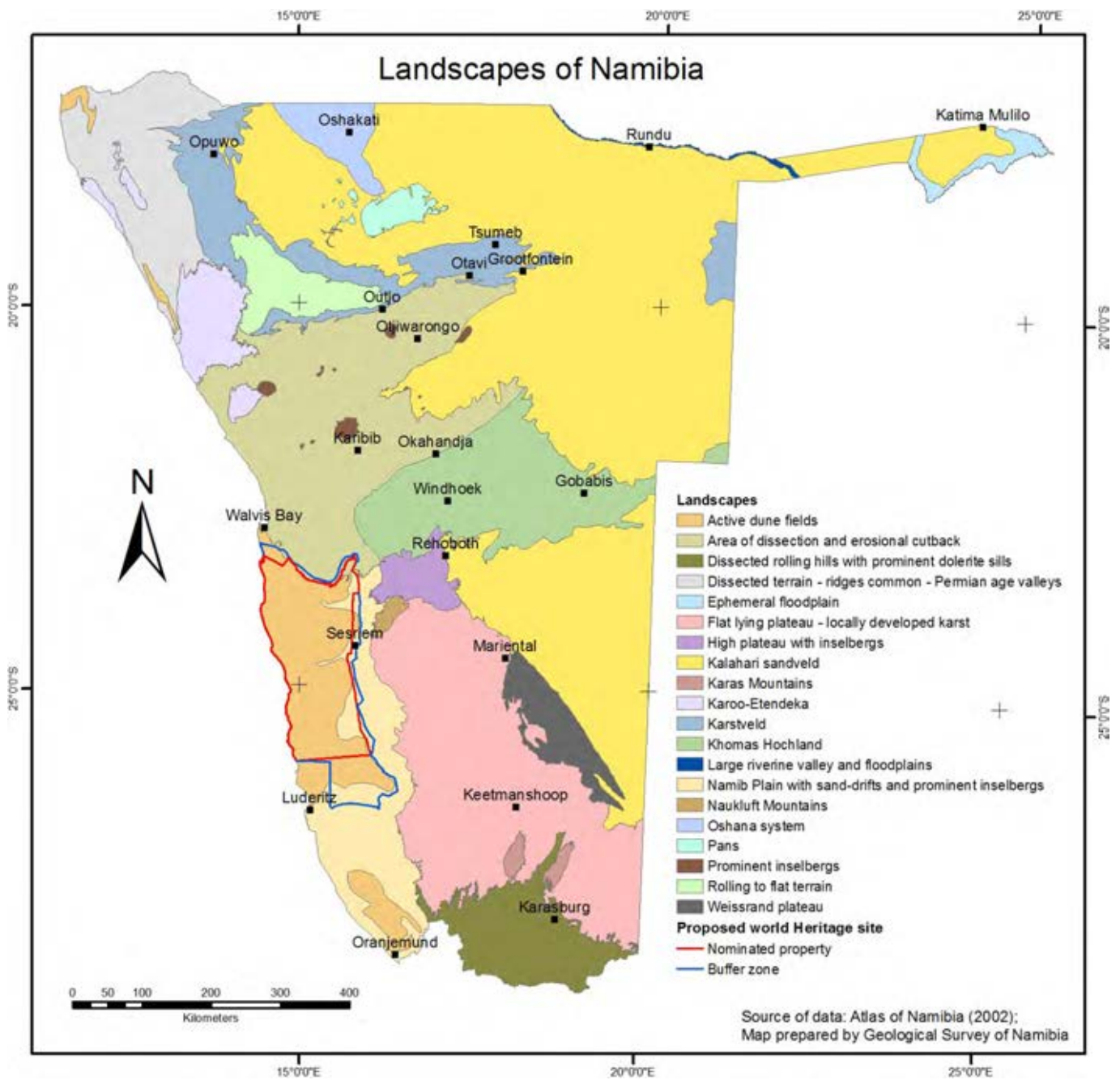
Digital elevation model from
Atlas of Namibia (2002)
Map prepared by Geological Survey of Namibia
© Government of Namibia 2011

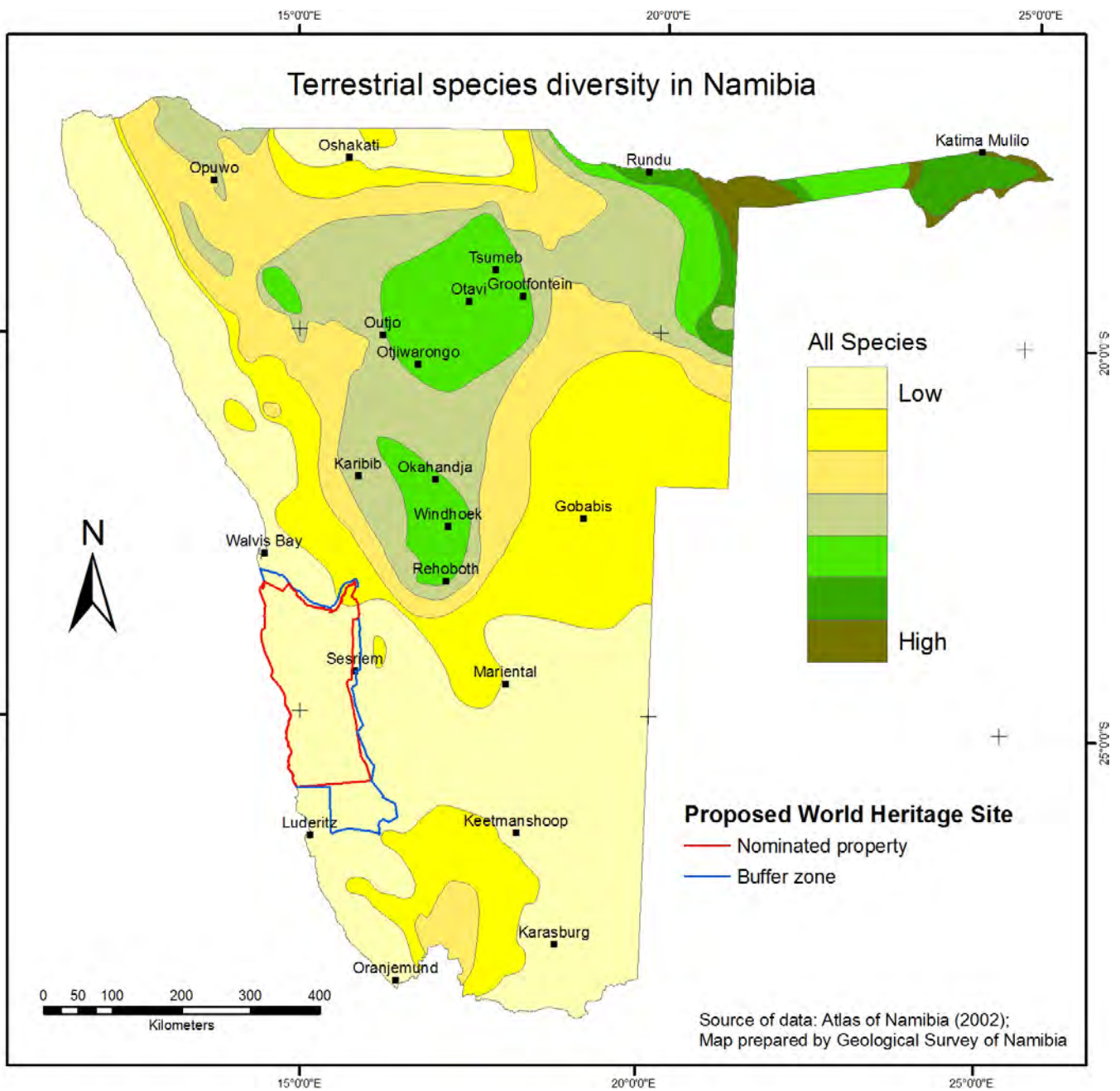


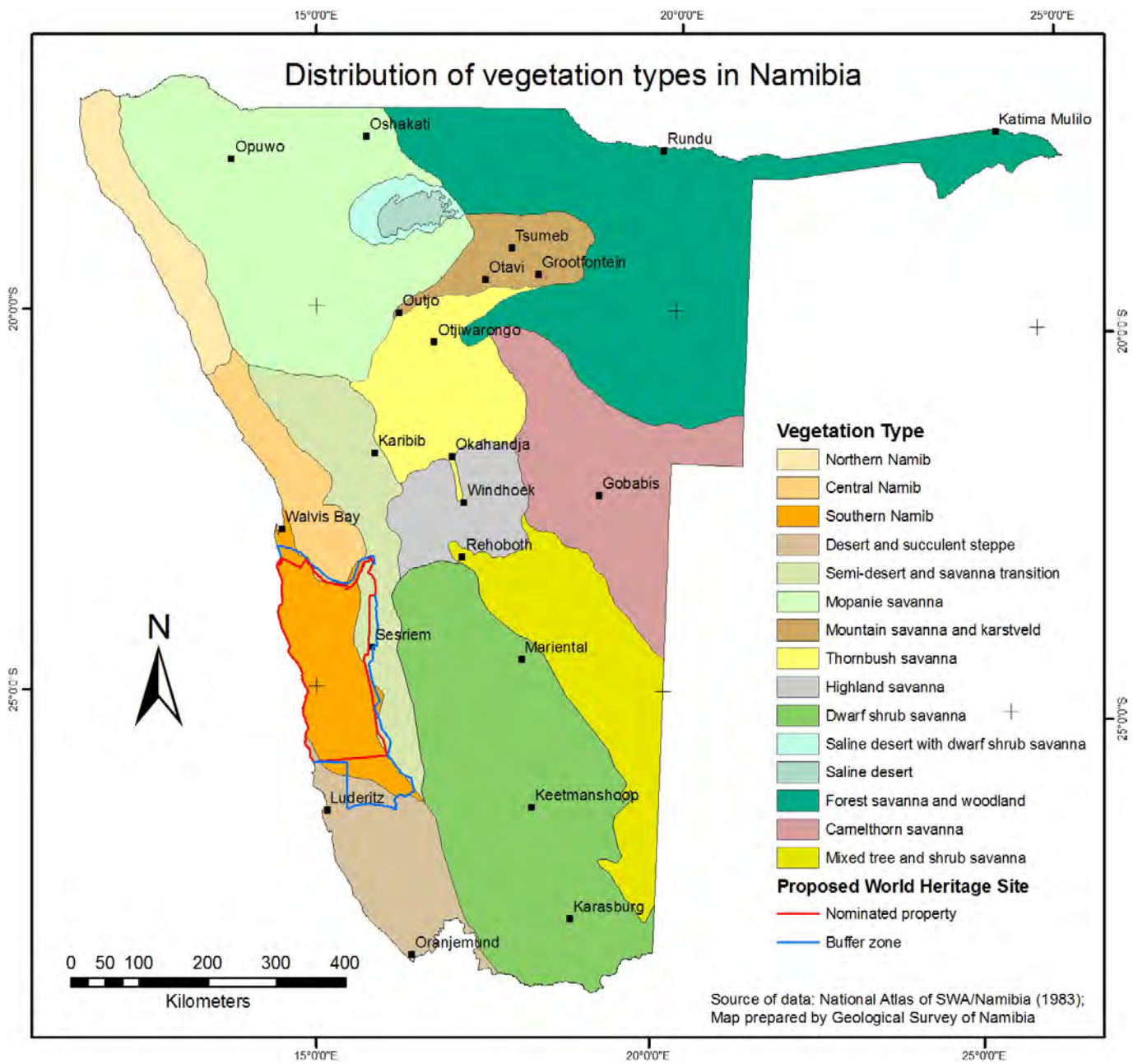
Places, rivers and areas within the Nominated Property

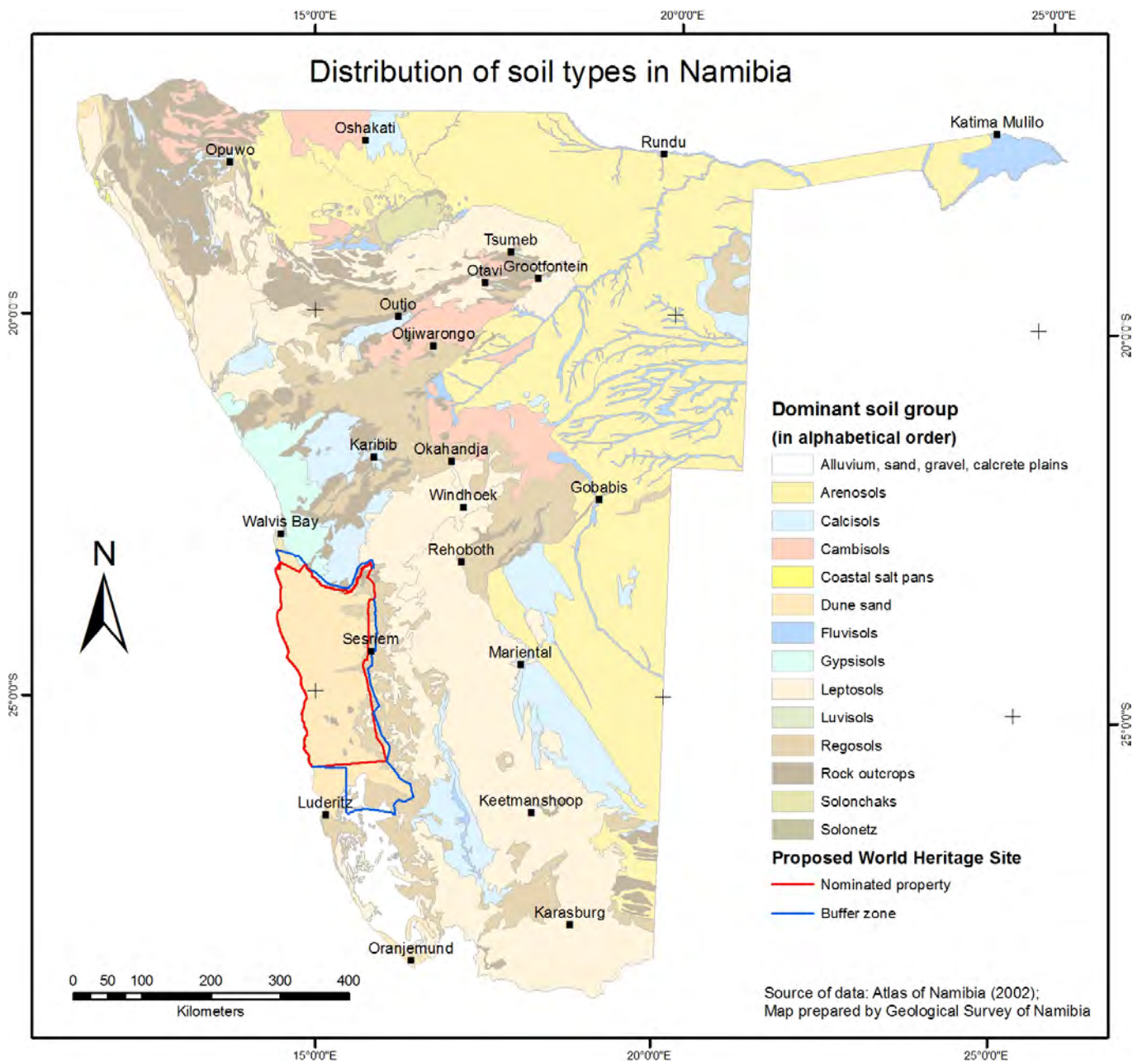


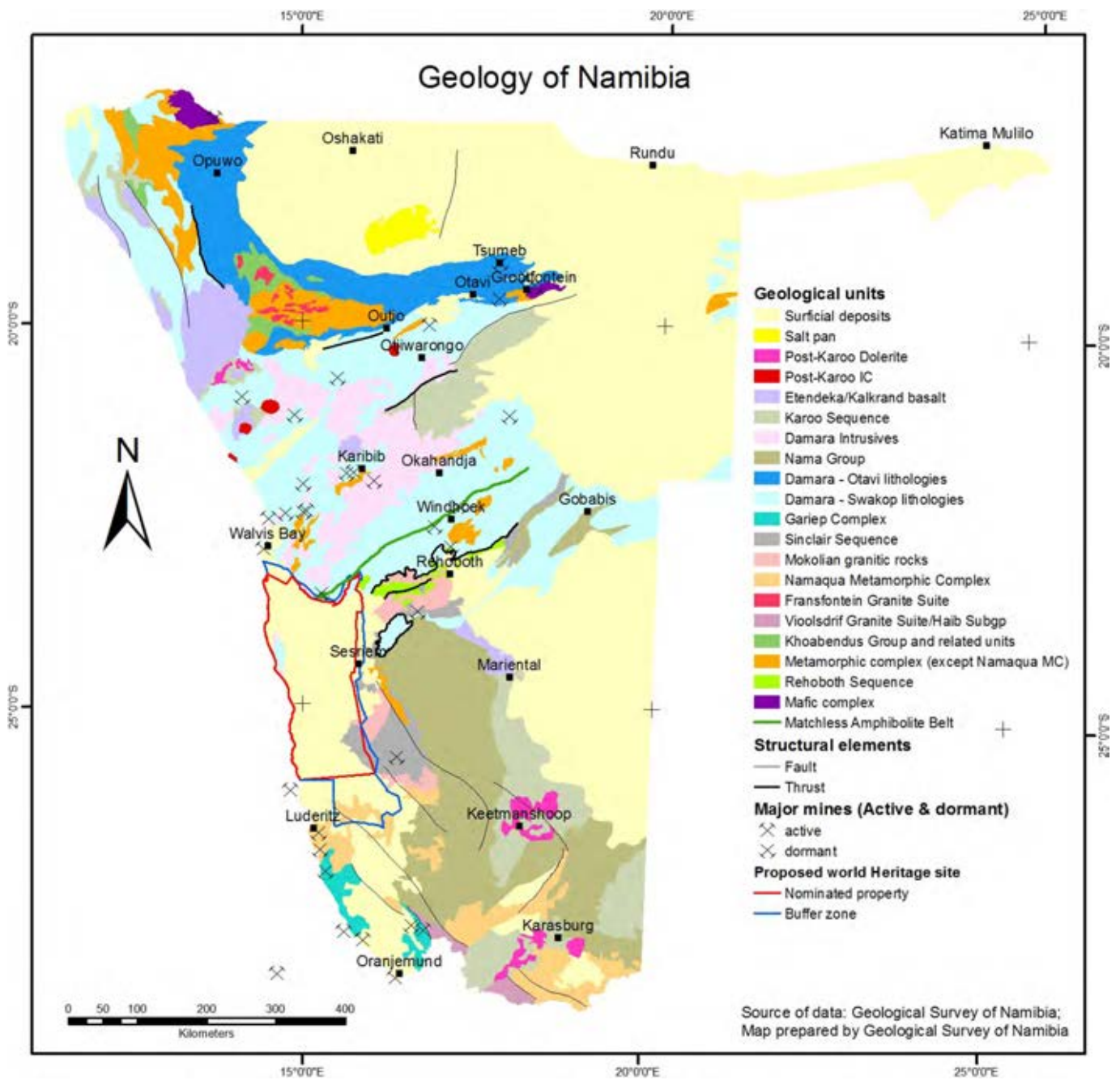


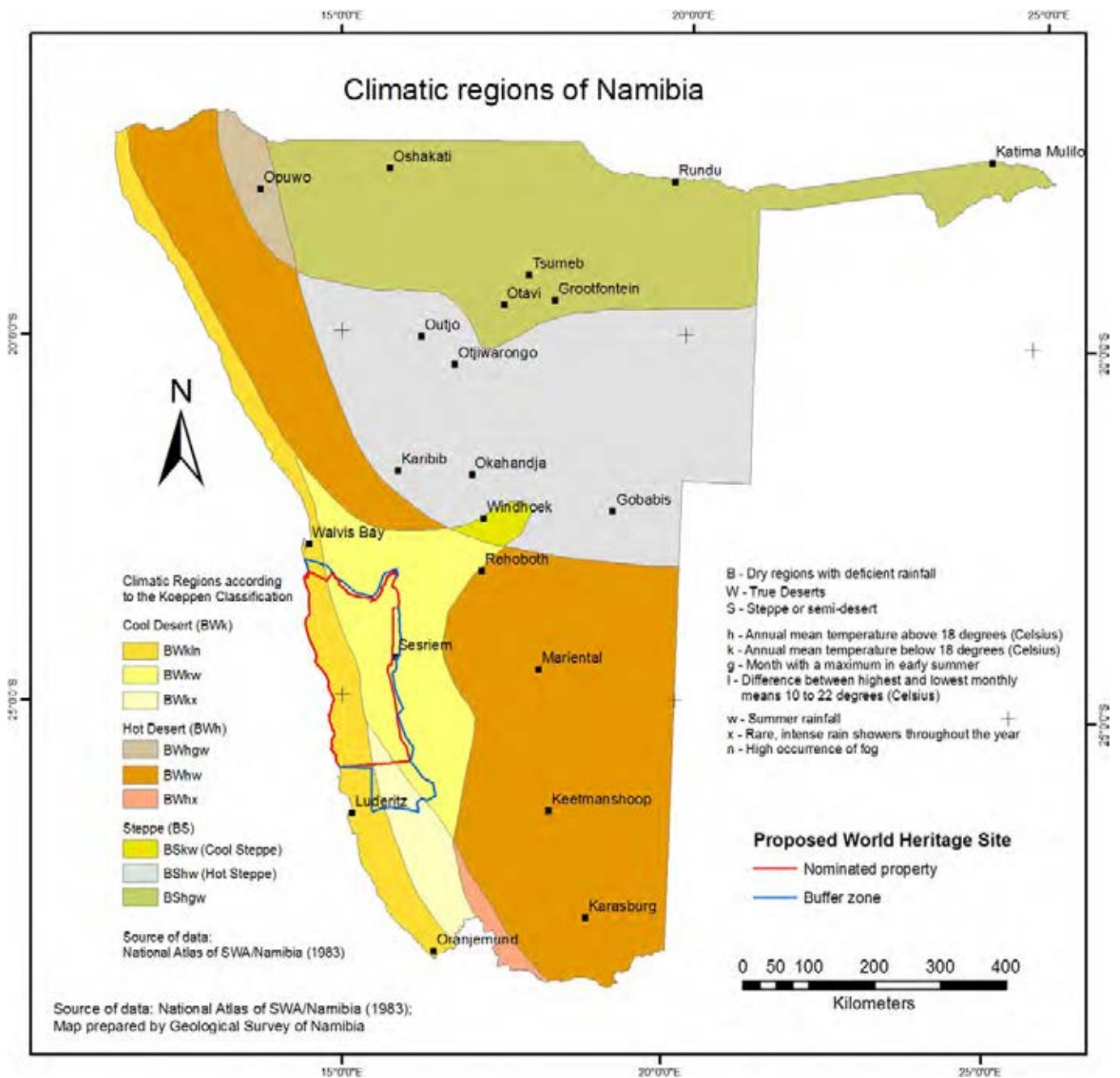


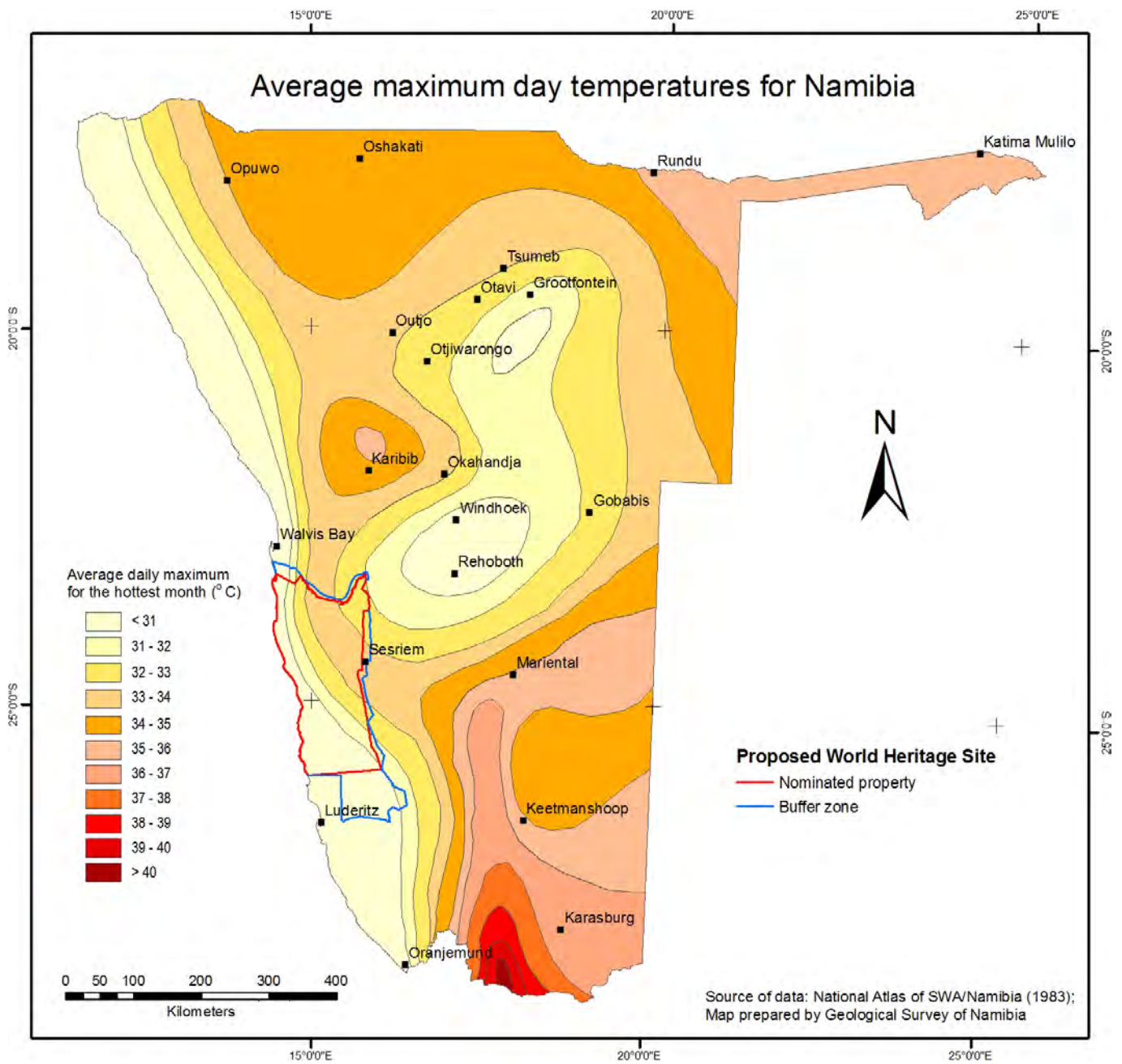


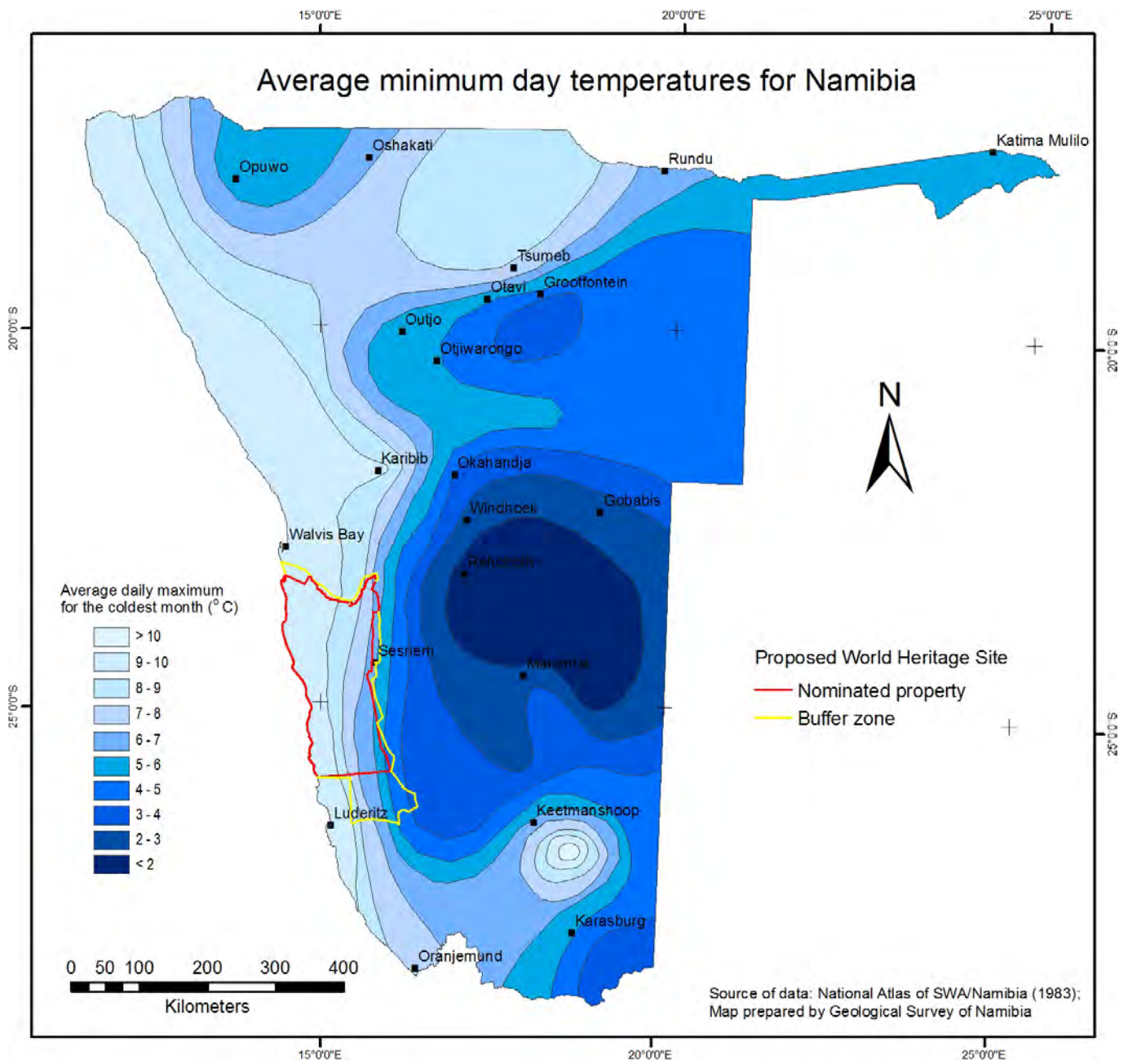


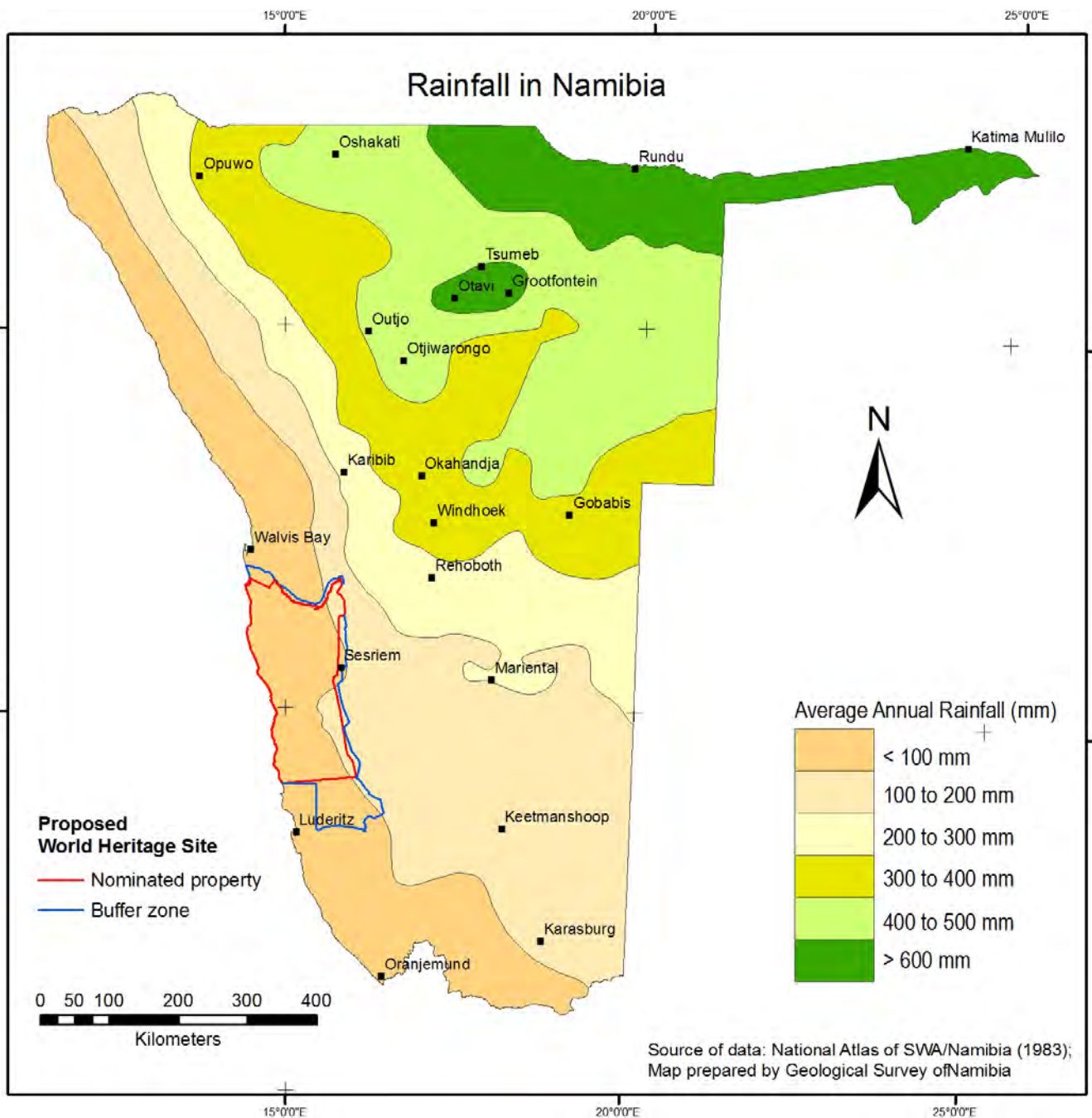




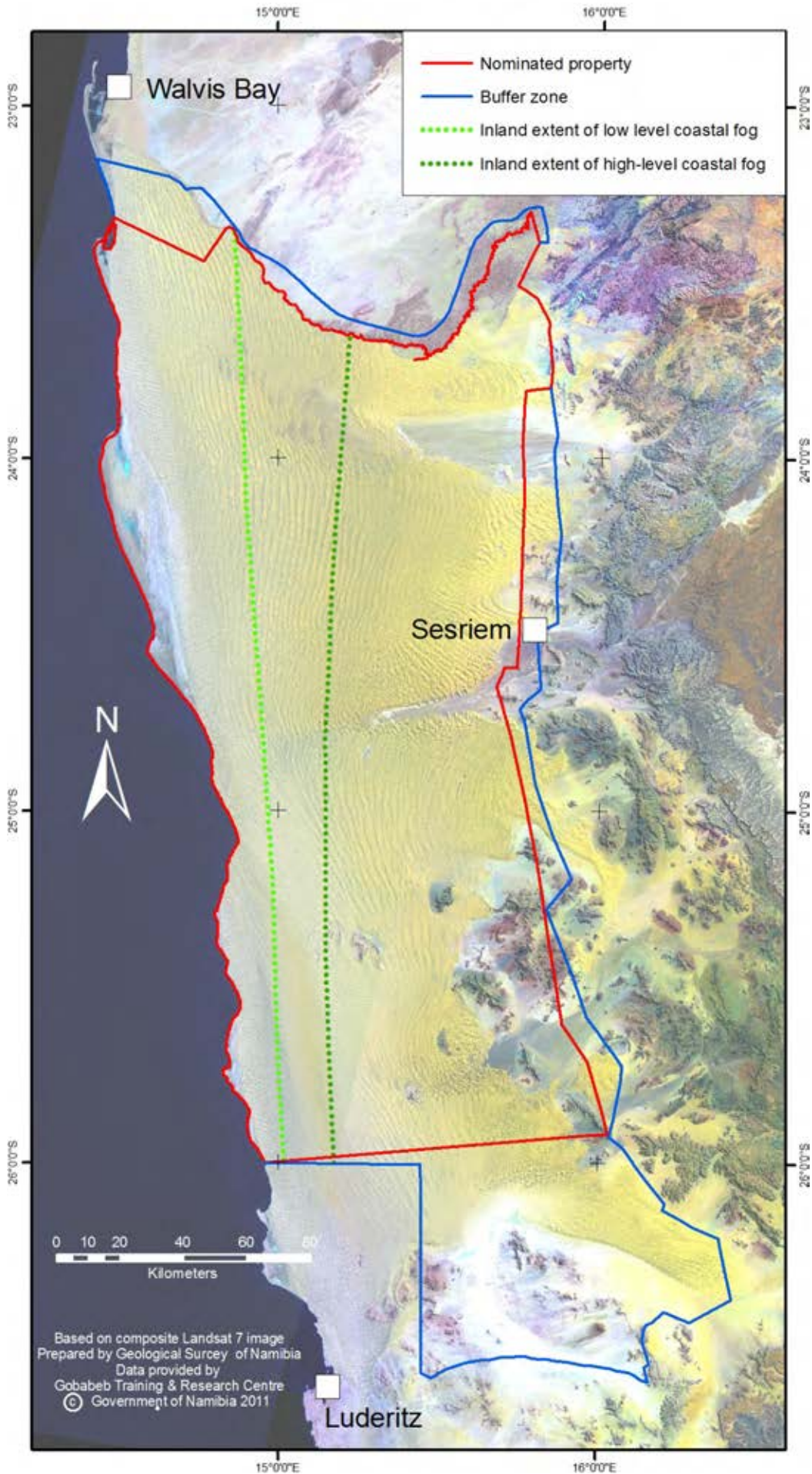






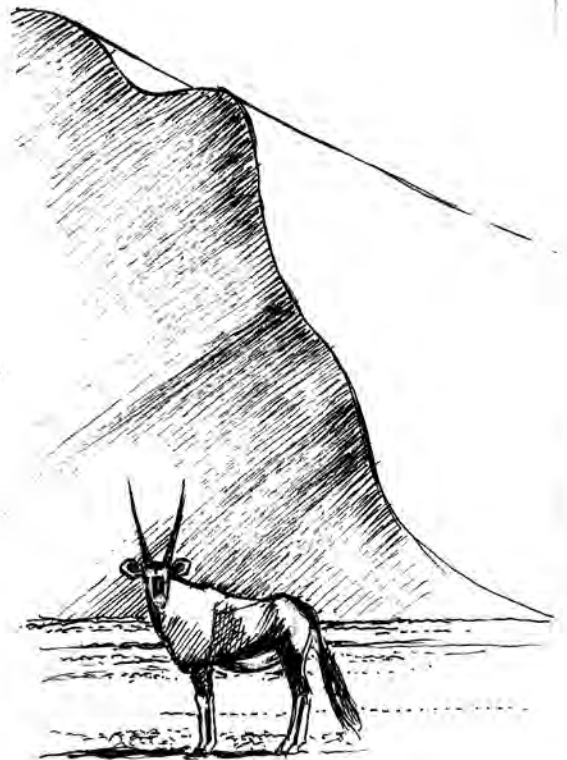


Generalised Limits of Coastal Fog over the Namib Sand Sea



Annex 3

Namib Sand Sea Comparison



THE NAMIB

Namib Sand Sea Comparison

Desert World Heritage Properties

World Heritage properties with earth science features of Outstanding Universal Value were listed by Dingwall et al. (2005). From these, Goudie and Seely (2011) identified eight **desert** World Heritage properties with earth science features of Outstanding Universal Value: Dinosaur Provincial Park (Canada), Grand Canyon National Park (USA), Ischigualasto/Talampaya Natural Parks (Argentina), Purnululu National Park (Australia), Tassili n'Ajjer (Algeria), Uluru-Kata Tjuta National Park (Australia), Wadi Al-Hitan (Egypt) and Willandra Lakes Region (Australia). The properties display a variety of geomorphological features ranging from fluvial features to sandstone and granite, mountains and plains. **Annex 1** lists these properties and their features (from Table 1, Dingwall et al. 2005).

A provisional assessment suggests that two properties can be identified as World Heritage properties with significant earth values, but which are inscribed on the World Heritage List for other reasons (Dingwall et al. 2005). Both properties, Air Ténéré (Niger) and Banc d'Arguin (Mauritania), are on the African continent and both were listed for their biodiversity values. Their geomorphological characteristics include plateaus, canyons, dunes and a volcanic massif as well as a coastal saline, mangrove swamp and salt marsh. **Annex 2** lists these properties and their features.

Three inscribed desert properties were not identified in the list of Dingwall et al. (2005). They lie in Africa (Lake Turkana, Kenya), Asia (Uvs Nuur Basin, Russia and Mongolia) and South America (Valdés Peninsula, Argentina) and their geomorphological features include: a rift valley lake, delta and active volcanoes, salt lakes and salt pans. **Annex 3** lists these properties and their features.

Five inscribed cultural properties with significant desert geomorphological values have been identified in South America, Asia and Africa: Humberstone and Santa Laura Saltpeter Works (Chile), Petra (Jordan), Rock-Art Sites of Tadrart Acacus (Libya), Tsodilo (Botswana) and Twyfelfontein (Namibia). Their geomorphological features include nitrate (caliche) deposits, weathering of sandstone, rock domes and ancient dunes. **Annex 4** lists these inscribed cultural properties and their outstanding features.

State Parties have filed Tentative Lists of potential World Heritage sites in their territories. Due to both changing information and lack of detail in some Tentative List entries, it is not possible to present a completely exhaustive review of all Tentative List sites relating to deserts that have been put forward by State Parties. However, seventeen desert landscape sites were identified by Goudie and Seely (2011) which have been included by State Parties on their Tentative Lists. Two are suggested in the Tentative Lists as possible mixed properties, two as cultural properties

and the remainder as natural properties. In terms of location, six are in Asia, eight in Africa and three in South America. The geomorphological characteristics cover a wide variety of forms. **Annex 4** lists these Tentative List sites. It should be noted that, due to the ever changing nature of notified Tentative Lists, this range of properties will vary over time, and is likely to have varied at least slightly since the above analysis was completed.

It is evident from this survey that there are very large gaps in the coverage of desert landscapes and geomorphological features in existing World Heritage properties. In particular it is clear that the most distinctive landforms and land forming processes of deserts - aeolian features - are not reflected in the World Heritage List. This is the case for dunes, yardangs, pans, dust sources and coastal sabkhas, and this is also true for weathering forms and various types of crust, rind and varnish and for desert karst features, tufas, various Quaternary phenomena (e.g. ancient river systems and pluvial lakes) and some highly important fluvial phenomena, including alluvial fans, pediments and debris flow phenomena.

The significance of the Namib

The proposed Namib Sand Sea property is therefore of great significance. It has benefitted from an extended period of detailed desert research based at the Gobabeb Training and Research Centre, which has made it one of the best known locations for the study of desert landforms. There is now a remarkable body of information available, much of which has now been incorporated into a digital data base (Livingstone et al., 2010)

The modern Namib Sand Sea is underlain by a fossil desert of Tertiary age, represented by the lithified Tsondab Sandstone. This is one of Earth's greatest spreads of aeolianite, and it preserves a very long history of aeolian sedimentation and of environmental information (as indicated by the organic remains preserved within it). The Tsondab Sandstone Formation is indeed a truly remarkable phenomenon. It is a red brown rock, up to 220 m thick, which underlies great tracts of the modern Namib Sand Sea and beyond (Ward, 1988). Large parts of the Tsondab Sandstone are dune materials (Kocurek et al. 1999), though there are also materials that must have been laid down in salt lakes and in ephemeral rivers. The aeolian deposits appear to have formed under a similar wind regime to that of the present. They also contain the fossilized tracks of termites and golden moles that live in the Namib today, together with lithified ostrich eggs. The cemented Tsondab Sandstone erg dates from at least the Lower Miocene, and overlies wind-sculptured Late Proterozoic rocks (Senut et al., 1994).

In addition, the Namib is one of the oldest deserts in the world, and there is sparse evidence of any very markedly wetter conditions since the early Cretaceous. This again means that it is a superb exemplar of landform evolution under aridity. The existence of arid conditions in the Namib must have been controlled to a considerable extent by seafloor spreading leading to the opening up of the seaways of the Southern Ocean as Africa and South America split apart in the late Jurassic and early Cretaceous around 130 million years ago. In addition, the movement of Antarctica to the South Pole, and the resulting initiation of the offshore, cold Benguela Current (Goudie and Eckardt, 1999) were important. The precise date of the birth of this aridity in the Namib has, however, been a matter of some controversy though its great antiquity in comparison with many of the world's deserts seems clear. Ward et al. (1983) said (p. 182) that "A review of the Late-

Mesozoic-Cenozoic geology leads us to conclude that the Namib tract, which dates back to the Cretaceous, has not experienced climates significantly more humid than semi-arid for any length of time during the last 80 million years". The Namib is not unique in terms of its aridity, and the Atacama, for example, has been dry since at least the Miocene.

The Namib also contains the full range of dune types (barchan, transverse ridge, shrub coppice, obstacle, linear and star) (Lancaster 1989), excellent examples of the ways in which river courses can be blocked by dunes (as at Sossus Vlei), clear illustrations of the interactions between dune occurrence and coastal lagoon and sabkha evolution (as at Sandwich Harbour), great spreads of calcretes, gypcretes (Watson, 1979; Watson 1985, Watson, 1988; Wilkinson et al., 1992; Eckardt and Spiro, 1999; Eckardt et al., 2001), massive spreads of tufa (Viles et al., 2007), and many examples of granite weathering and inselberg and pediment formation (Goudie, 1972).

Of particular importance is the role of the Namib for illustrating a large range of dune forms, their relationship to wind regimes, their sources of sediment, their antiquity, their relationship to river systems, and their changing colour from the coast to inland. The dunes in the area have also been seen as potential analogues for Mars (Bourke and Goudie, 2009).

At the coast crescentic dunes are dominant, including highly mobile barchans (Slattery, 1990; Barnes, 2001). Their horns point in the direction of movement, they have steep slopes (c 32 degrees) on their lee sides and gentler slopes (2-10 degrees) on their windward (stoss) sides, they have an ellipsoidal shape in plan-view, and have formed in response to the strong unidirectional (SSW) wind regimes that are prevalent in the coastal zone.

The heart of the sand sea is dominated by linear dunes that are associated with more bi-directional wind regimes (SSW-SW and NE-E). The former winds blow inland from the South Atlantic Ocean and the latter sweep down the Great Escarpment from the interior. The dominant annual sand movement appears to be from the south. The spacing of the linear dunes varies through the sand sea. It is greatest in the central regions at 1800-2500 m, whereas in the southern parts these dunes are generally spaced at 1500-2000 m. The dunes are mostly between 600 and 900 m wide and between 50 and 150 m high. They are the dominant dune form in the sand sea. These dunes are notable for having been the subject of detailed studies of their movement history since the 1980s (Livingstone, 1986, 1989, 2003), of the pattern of wind flow and sand movement over the dune surface (Livingstone, 1988) and for the recent examination of their internal structures using Ground Penetrating Radar (Bristow et al. 2007).

Star dunes, characterised by their pyramidal morphology and radiating sinuous arms, are associated with complex, multidirectional wind regimes (SW-WSW, NE-E and N) that occur along the sand sea's eastern margin, close to the Great Escarpment. The dunes are highest and most widely spaced in the central and some northern parts of the erg, with progressively lower and more closely spaced dunes towards the margins. Some of the star dunes, including those in proximity to the much visited Sossus Vlei, are well over 150 m high, and some may reach heights of 200-300 m, making them some of the largest dunes in the world, only exceeded perhaps by those of China's Badain Jaran Desert (Yang, 2001).

The colour of the dune sand of the Namib shows clear spatial trends. In coastal areas dominated by crescentic dunes the sand is yellowish brown to light yellowish brown, whereas in eastern areas it

becomes a very striking yellowish red, a shade that would not disgrace a ripe apricot. Similar trends have been noted elsewhere (as in the Rub Al Khali of the United Arab Emirates) but it is in the Namib that some of the most detailed studies of this phenomenon have been undertaken (Walden and White, 1997; Walden et al., 1996).

The Namib is also an excellent example of a coastal desert, marked by extensive fog precipitation, which plays an important role in rock weathering, especially by salt, which appears to be a very rapid cause of rock decay (Goudie and Parker, 1998; Goudie et al. 1997). Fog occurs on over 100 days in the year in the area around Swakopmund. This precipitates appreciable amounts of moisture (c 34 mm per year at Swakopmund) and rather more on some of the interior inselbergs. However, notwithstanding the fogs, it is also one of the world's driest deserts. Rainfall at the Namibian coastal resort of Swakopmund averages a mere 10-20 mm per annum, but increases towards the base of the Great Escarpment, where it may exceed 200 mm. Perhaps only the Atacama and the Libyan Desert are drier, and so it is a good exemplar of the geomorphological role of extreme aridity. It also shows a sharp temperature and precipitation gradient as one moves inland, and this too has significance for illustrating climatic controls on weathering processes and phenomena (Viles, 2005; Viles and Goudie, 2000, Viles and Goudie, 2007). This part of the Namib is also being used to study potential Martian weathering analogues (Bourke and Viles, 2007).

Conclusions

The existing World Heritage List has relatively few desert properties, and those that exist are not noted for the development of their dune forms. The proposed Namib property has been the subject of intensive research, and it is apparent that in global terms it is notable for:

- (1) Its fogginess, aridity and clear climatic gradient inland, which makes it an ideal location for testing the way in which weathering processes operate in deserts
- (2) Its antiquity, which though not unique, is substantial
- (3) The ancient aeolianite erg that underlies the modern erg
- (4) The presence of a comprehensive suite of well-developed dune forms that make it an ideal model to study dunes in the context of a whole erg
- (5) The relationships between dunes and rivers and dunes and coastal structures
- (6) The pattern of colouration across the erg
- (7) The size of some of its dunes, which are among the highest in the world
- (8) The utility of the Namib as a model for some of the aeolian and weathering forms on Mars
- (9) The long term data that are available on rates of dune crest migration

References

- Barnes J. (2001), Barchan dunes on the Kuiseb River delta, Namibia. *South African Journal of Geography* 83, 283-292.
- Bourke, M.C. and Goudie, A.S. (2009). Varieties of barchan form in the Namib Desert and on Mars. *Aeolian Research*, 1, 45-54.

- Bourke, M.C. and Viles, H.A. (2007). A Photographic Atlas of Rock Breakdown Features in Geomorphic Environments. Tucson: Planetary Science Institute.
- Bristow, C.S., Duller, G.A.T., and Lancaster, N. (2007). Age and dynamics of linear dunes in the Namib Desert. *Geology* 35, 555-558.
- Dingwall, P., Weighell, T., Badman, T. 2005. Geological World Heritage: A Global Framework. A contribution to the Global Theme Study of World Heritage Natural Sites. Protected Area Programme, IUCN. 51pp.
- Eckardt F.D. and Spiro B., (1999). The origin of sulphur in gypsum and dissolved sulphate in the Central Namib Desert, Namibia. *Sedimentary Geology* 123, 255-273.
- Eckardt F.D., Drake N., Goudie A.S., White K and Viles H. (2001). The role of playas in pedogenic gypsum crust formation in the Central Namib Desert: a theoretical model. *Earth Surface Processes and Landforms* 26, 1177-1193.
- Goudie, A. S. (1972). Climate, weathering, crust formation, dunes and fluvial features, of the Central Namib Desert, near Gobabeb, South West Africa. *Madoqua series II*, 1, 15-31.
- Goudie, A.S. and Eckardt, F. (1999). The evolution of the morphological framework of the Central Namib Desert, Namibia, since the Early Cretaceous. *Geografiska Annaler* 81A, 443-458.
- Goudie, A.S., and Parker, A.G. (1998). Experimental simulation of rapid rock block disintegration by sodium chloride in a foggy coastal desert. *Journal of Arid Environments*, 40, 347-55.
- Goudie, A. and Seely, M. (2011). World Heritage Desert Landscapes: Potential Priorities for the Recognition of Desert Landscapes and Geomorphological Sites on the World Heritage List. Gland, Switzerland: IUCN. 44pp.
- Goudie, A.S., Viles, H.A. and Parker, A.G. (1997). Monitoring of rapid salt weathering in the central Namib using limestone blocks. *Journal of Arid Environments*, 37, 581-98.
- Kocurek G., Lancaster N., Carr M., and Frank A. (1999) Tertiary Tsondab Sandstone: preliminary bedform reconstruction and comparison to modern Namib Sand Sea dunes. *Journal of African Earth Sciences* 29, 629-42.
- Lancaster, N. 1989. The Namib Sand Sea. Rotterdam, Balkema.
- Livingstone, I. (1986). Geomorphological significance of wind flow patterns over a Namib linear dune. In *Aeolian Geomorphology*, ed. W. G. Nickling. Boston: Allen and Unwin, pp. 87-112.
- Livingstone, I. (1988). New models for the formation of linear sand dunes. *Geography*, 73, 105-15.
- Livingstone, I. (1989). Monitoring change on a Namib linear dune. *Earth Surface Processes and Landforms*, 14, 317-32.
- Livingstone, I. (2003), A Twenty-One-Year record of surface change on a Namib linear dune. *Earth Surface Processes and Landforms* 28, 1025-1031.
- Livingstone, I., Bristow, C., Bryant, R.G., Bullard, J., White, K., Wiggs, G.F.S., Baas, A.C.W., Bateman, M.D. and Thomas, D.S.G. (2010). The Namib Sand Sea digital database of aeolian dunes and key forcing variables. *Aeolian Research*, 2, 93-104.

- Senut B., Pickford M. and Ward J., (1994). Biostratigraphie de éolianites néogènes du Sud de la Sperrgebiet (Désert de Namib, Namibie). *Comptes Rendus de l'Academie des Sciences* 318, 1001-7.
- Slattery M.J., (1990). Barchan migration on the Kuiseb River Delta, Namibia. *South African Geographical Journal* 72, 5-10.
- Viles, H.A. (2005). Microclimate and weathering in the Central Namib Desert, Namibia. *Geomorphology*, 67, 189-209.
- Viles, H.A. and Goudie, A. S. (2000). Weathering, geomorphology and climatic variability in the Central Namib Desert. In *Linking Climate Change to Land Surface Change*, ed. S.J. McLaren and D.R. Kniveton. Dordrecht: Kluwer, pp. 65-82.
- Viles, H.A. and Goudie, A.S. (2007). Rapid salt weathering in the coastal Namib desert: implications for landscape development. *Geomorphology*, 85, 49-62.
- Viles, H.A., Taylor, M.P., Nicholl, K. and Neumann, S. (2007). Facies evidence of hydroclimatic regime shifts in tufa deposition sequences from the arid Naukluft Mountains, Namibia. *Sedimentary Geology*, 195, 39-53.
- Walden J. and White K., (1997). Investigation of the controls on dune colour in the Namib Sand Sea using mineral magnetic analyses. *Earth and Planetary Science Letters* 152, 187-201.
- Walden J., White K. and Drake N.A., (1996). Controls on dune colour in the Namib Sand Sea: preliminary results. *Journal of African Earth Sciences* 22, 349-353.
- Ward J.D., (1988). Eolian, fluvial and pan (playa) facies of the Tertiary Tsondab Sandstone Formation in the Central Namib Desert, Namibia. *Sedimentary Geology* 55, 143-162.
- Ward J.D., Seely M.K. and Lancaster N., (1983). On the antiquity of the Namib. *South African Journal of Science* 79, 175-183.
- Watson, A. (1979). Gypsum crusts in deserts. *Journal of Arid Environments*, 2, 3-20.
- Watson, A. (1985). Structure, chemistry and origin of gypsum crusts in southern Tunisia and the Central Namib Desert. *Sedimentology*, 32, 855-75.
- Watson, A. (1988). Desert gypsum crusts as palaeoenvironmental indicators: a micropetrographic study of crusts from southern Tunisia and the central Namib Desert. *Journal of Arid Environments*, 15, 19-42.
- Wilkinson, M.J., Hems, D.R. and Whitehead, V.S. (1992). Albedo patterns and gypsum generation in the Central Namib Desert: Land, sea and air interactions on an arid west coast. *Geoscience and Remote Sensing Symposium*, 1992, 2, 1565-7.
- Yang, X. (2001). Late Quaternary evolution and paleoclimates, western Alashan Plateau, Inner Mongolia, China. *Zeitschrift für Geomorphologie*, 45, 1-16.

Annex 1: World Heritage properties with earth science features of Outstanding Universal Value (from Table 1, Dingwall, Weighell, Badman, 2005)

WHS Name	Country	Mean annual rainfall	Desert type	Desert Classification	Geomorphological features	Reason for listing	Cultural significance	Research and facilities	Biodiversity significance	Vegetation type	Vegetation richness	Degree of endemism	Fauna - vertebrate	Faunal richness	Degree of endemism	Fauna - invertebrate	Faunal richness	Degree of endemism
Dinosaur Provincial Park	Canada	406	Semi-arid	Grassland	Badlands; fluvial erosion patterns	Fossil beds	Archaeological sites of native 'Plains Indian Culture'	Long-term palaeontological research; geomorphic process research in drainage basin	Fossil fauna deposits	Grassland; cottonwood riparian	Badlands provide habitat for number of ecologically specialised plant species	Cottonwood Riparian most endangered in semi-arid regions; 10 species threatened or at limit of ranges	Many dinosaur remains	38 species of dinosaurs; 150 birds, 1 toad; critical winter range for native ungulates	7 birds locally threatened or at their biogeographical limits	No comment	No comment	No comment
Grand Canyon National Park	USA	210-440	Semi-arid	Mountain desert	Canyon; Groundwater action; long-term slope evolution	Deeply Incised canyon	Prehistoric ruins attraction; outstanding private development in natural attraction	Major studies in geology, archaeology, fire management, sociology, ecological impacts and fauna and flora; resource study collection	Forest and game reserve originally	Five vegetation types; Desert cactus to spruce and pine	1500+ including representatives of 5 of 7 life zones of North America	11 threatened species in park; 15 species recommended for listing as threatened	No comment	300+ birds; 76 mammals; 50 reptiles; 25 fish	1 mammal and 1 reptile endemic to park; 3 rare or threatened birds; 2 threatened fish species	No comment	No comment	No comment
Ischigualasto/Talampaya Natural Parks	Argentina	<200	Semi-arid	Temperate	Rivers and lakes; cliffs; badlands	Vertebrate fauna fossil site	Previously aborigines, Inca sites, rock art, no current inhabitants	Intensive research, recently by provincial universities where major displays exist; no facilities in the park	Fossil site, vertebrate fauna during Tertiary	Xeric shrubs and cactus, mesquite	172 species; 6 with special value; 100 fossil plants	No statistics	No comment	20 mammals, 36 birds, 20 reptiles and amphibians	No comment	No comment	No comment	
Purnululu National Park	Australia	500-700	Sub-humid	Hot	Sandstone tower karst	Natural site, aboriginal title	Aboriginal Australians; restricted pastoralism	Various geographical, social, botanical research visits and publications	Vegetation reflects transition location	Northern tropical savanna to inland arid desert	17 vegetation communities; 653 species including 628 higher plants (597 native), 17 ferns, 8 lower plants	2 regionally endemic grevilleas; centre of endemism for spinifex	Missing of tropical and desert species	298 vertebrate species: 41 mammals, 149 birds, 81 reptiles, 12 amphibians, 15 fish	No comment	No comment	No comment	

Tassili n'Ajjer	Algeria	25	Hyp-arid	Hot	Sandstone plateau, granite massif	Scenic and geological interest prehistoric cave art; floristic and faunal island of Sahelian life	15,000 neolithic rock engravings and cave paintings; from 12,000 BC; sparsely inhabited by nomadic Tuareg	Experimental centre at archaeological site of Timenzouze; ongoing studies, natural resource inventories and conservation of rock art	Floristic and faunal island of Sahelian life in the middle of the desert; relict Mediterranean cypress	Sheltered Mediterranean and Sahelian flora; Sudanian riverine vegetation; endemic Saharan species	Species noted, no statistics	28 plants rare in Algeria	Mediterranean and Saharan Palaeartic species; important for resting migratory birds	4 fish species; 23 larger mammals (5 endangered)	No comment	Diverse invertebrate fauna with relict Afro-tropical and Palaeartic species	Large number of spiders and insects	No comment
Uluru-Kata Tjuta National Park	Australia	310	Semi-arid	Hot	Conglomerate mountains with sand plain	Aboriginal heritage, landscape, geology and arid desert eco-systems	Aboriginals; centre of local and religious significance; cave paintings	First expedition in 1894; many studies since 1930s: anthropology, climate, geology, hydrology, fauna and flora and major fauna survey in 1994 and 1995	No comment	Hardy perennial grass, acacia, low trees in soil pockets; foothills with grasses and shrubs; fans and outwash alluviums support complex of open grassland, low trees and shrubs; Plains support dense groves with perennial grass understory; sand dunes with grass, eucalypts and acacias.	No statistics	No statistics	No comment	22 native mammals; 150 bird species, 5 Australian reptile families represented; aestivating amphibians	No comment	Poorly known	No comment	No comment

Wadi Al-Hitan (Whale Valley)	Egypt	10.1	Hyper-arid	Hot	Misc.	Fossil whales; Eocene fossil site; 25 genera of more than 14 families of vertebrates	Abandoned in historical times, Faiyum depression, continuous habitation from Neolithic	Various research visits and publications; regulated scientific exploration and specimen collection	Eocene fossil site, esp. whales	Barren; few shrubs	No statistics	No statistics	Very sparse	19 reptiles, 36 breeding birds, few mammals	No comment	No comment	No comment	No comment
Willandra Lakes Region	Australia	290	Semi-arid	Hot	Pluvial lakes; dunes, lunettes	Dry lake basins	Human use sites for 30,000 years; currently 40 inhabitants	Considerable research; existing bibliography; benchmark study of changes in earth magnetism	Fossil remains of giant marsupials	Sparse scattered shrubs and woodlands interspersed with plains and dunes	No statistics	No statistics	No comment	20 mammal species recorded	No comment	No comment	No comment	No comment

Annex 2: World Heritage natural and mixed properties with significant earth science values, inscribed on the World Heritage List for other reasons (provisional assessment) (from Table 2 of Dingwall et al. 2005)

WHS Name	Country	Mean annual rainfall	Desert type	Desert Classification	Geomorphological features	Reason for listing	Cultural significance	Research and facilities	Biodiversity significance	Vegetation type	Vegetation richness	Degree of endemism	Fauna – vertebrate	Faunal richness	Degree of endemism	Fauna – invertebrate	Faunal richness	Degree of endemism
Aïr and Ténéré Natural Reserves	Niger	20-100	Hyper-arid	Hot	Plateaus, canyons, dunes; volcanic massif	Sanctuary for Tuareg; 30,000 years of settlement; rock engravings and petroglyphs, pre-islamic tombs	Tuareg; 30,000 years of settlement; rock engravings and petroglyphs, pre-islamic tombs	Interest since 1850, mainly project visits; small, poorly-equipped laboratory at Iférouane	Outstanding variety of landscapes, plant species and wild animals	Sahelian floristic enclave within the Sahara; well wooded oases; relict Sudanese and Mediterranean species above 1000m; Saharan species	350+ species	No Statistics	Diversity; 9 species on IUCN Red List for Niger; Aïr harbours threatened ungulates	40 mammal species, 165 birds, 18 reptiles, 1 amphibian	No comment	Not inventoried	No comment	No comment
Banc d'Arguin National Park	Mauritania	34-40	Hyper-arid	Hot	Coastal saline; mangrove swamp; salt marsh	Wading birds; Ramsar Site	Traditional subsistence fishing; neolithic archaeological sites	Surveys and inventories since 1950s, field station at Cap Louik with outstation at Oued Chibka	Marine fauna and flora, esp. migratory coastal birds	Sea grass in shallow water; halophytic on coastline, mudflats and islands; mangrove swamps; terrestrial vegetation is Saharan	No statistics	No Statistics	World's largest concentration of wintering shore-birds (2 million +); mammals, marine mammals; fish spawning and nursery ground; 5 marine turtles species, 2 breeding.	249 bird species; 15 nesting piscivores	No comment	High productivity of pelagic and benthic phytoplankton; crabs; cockles and gastropods	No comment	No comment

Annex 3: Inscribed desert sites not identified on list of Dingwall et al. 2005

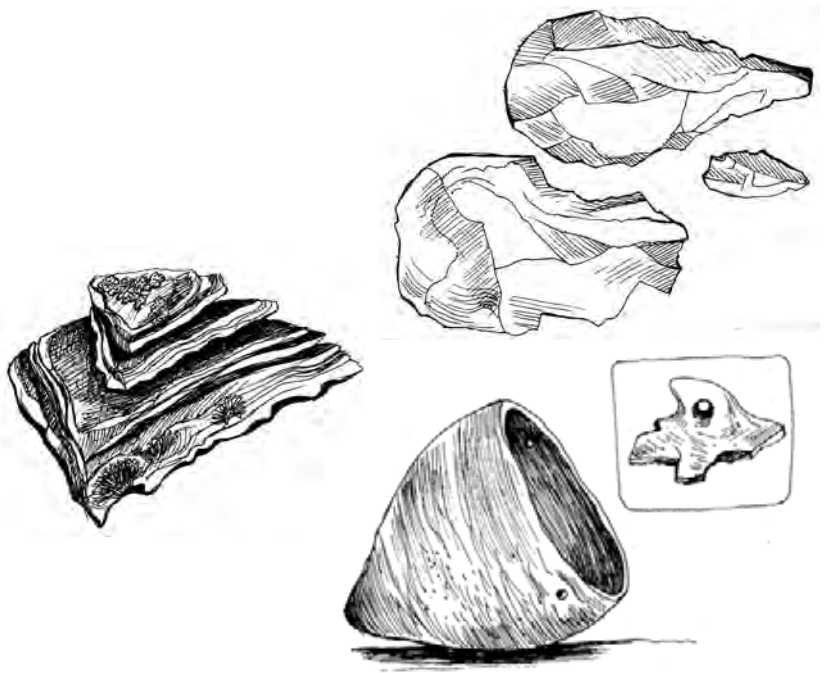
WHS Name	Country	Mean annual rainfall	Desert type	Desert Classification	Geomorphological features	Reason for listing	Cultural significance	Research and facilities	Biodiversity significance	Vegetation type	Vegetation richness	Degree of endemism	Fauna - vertebrate	Faunal richness	Degree of endemism	Fauna - invertebrate	Faunal richness	Degree of endemism
Lake Turkana National Parks	Kenya	<200	Hot	Semi-arid, hot	Rift valley lake, delta; active volcanoes	Koobi Fora hominid sites; migrant water fowl; crocodiles and hippos	Pastoralists and fishermen; 100+ archaeological sites	Extensive archaeological research	Outstanding laboratory for study of plant and animal communities; major breeding grounds for Nile crocodile and hippopotamus	Grassy savannas; sparse gallery woodlands	No statistics	No statistics	High diversity of particularly breeding and migrant birds; low carrying capacity of the area	350 aquatic and migrant bird species; 47 fish; large mammals	7 species regionally threatened; 7 endemic fish	No comment	No comment	No comment
Uvs Nuur Basin	Russia and Mongolia	150-200	Cold	Cold steppe desert	Salt lakes	Salt lake has birds, snow leopard, argali sheep	Long history of nomadic herding	Diversity of biomes makes it a natural subject for biophysical and genetic research. Extensive research since 1984. Biosphere Reserve in 1997 as study area for global change.	All major biomes of east central Asia; rare animals such as snow leopard and argali sheep	Cold desert, sand dunes, semi-desert, desert steppe, shrub steppe, wetlands, salty marshes, floodplain forest, deciduous and boreal forests, taiga, alpine meadows and tundra	552 species; 234 restricted to mountains; 52 relict species	19 endemic to Mongolia and Tuva, 5 endemic to Uvs Nuur	Diverse reflecting diversity of habitats	4 species of insectivora, 4 bats, 5 lagonomorphs, 32 rodents, 18 carnivores, 9 artiodactyla, 5 lizards, 3 snakes; 368 bird species	22 locally rare mammals, 81 birds rare and endangered, 2 fish endemic to western Mongolia live in Uvs Nuur	No comment	No comment	16 of 20 rarely met species of beetle are endemic on dune deserts
Valdés Peninsula	Argentina	240	Semi-arid	Cool	Salt pans	Marine sanctuary incl. whales and seals	Sheep farming	Focused on marine colonial mammals and birds	Important for several species of coastal and marine birds, which form breeding colonies on it	Desert steppe	18 communities; 130 species from 41 families	38 species endemic to Argentina	Numerous marine birds and mammals breed here; abundant terrestrial mammals; 181 bird species (66 migratory)	No statistics	No statistics	No comment	No comment	No comment

Annex 4

Annex 4 WHS Name	Country	Mean annual rainfall	Desert type	Desert Classification	Geomorphological features	Reason for listing	Cultural significance
Humberstone and Santa Laura Saltpeter Works	Chile	0	Hyper-arid	Coastal	Nitrate (caliche)	Historical, abandoned mining complex from 19th century; over 200 former works	Abandoned saltpeter factory
Petra	Jordan	150	Semi-arid	Warm	Weathering sandstone; gorges	Nabataean Caravan City	City, half built, half carved into rock
Rock-Art Sites of Tadrart Acacus	Libya	25	Hyper-arid	Hot	Sandstone weathering	Cave paintings	Thousands of rock paintings in very different styles
Tsodilo	Botswana	500	Sub-humid/ semi-arid	Hot interior savanna	Rock domes with ancient dunes	Over 4,500 rock paintings; 100,000 years chronological account of human activities and environmental change	San heritage
Twyfelfontein	Namibia	100	Hyper-arid	Warm	Sandstone rock domes with varnish and weathering rinds	Petroglyphs; largest concentration in Africa	San heritage last 2,000 years

Annex 4

Geology & History



GEOLOGY AND HISTORY OF THE NAMIB SAND SEA

Assembled from materials prepared by R McG Miller, GIC Schneider, M Pickford and G von Schumann

The Outstanding Universal Value of the Central Namib Sand Sea - A Geological Perspective

The oldest written record that includes a reference to the Central Namib Sand Sea is can be found in the documents of the 16th century Portuguese seafarers. This waterless desert wasteland impinging on the coast for hundreds of kilometers and the terrifying coastal storms have always struck fear in the hearts of seafarers. This region forms a large and formidable part of the so-called Skeleton Coast of Namibia. The Central Namib Sand Sea consists of a wide dune belt which is an almost impenetrable barrier to the hinterland from the coast and from the interior to the coast.

Yet, this environment is viewed with awe and fascination of its serene beauty and the ever-changing and curving flow lines of the dune crests and the various dune types.

Two dune systems are present. The older is semi-consolidated and as old as 21 million years. The younger is unconsolidated and has been active for about 5 million years. It covers the older system and is still accumulating. However, neither erg has been derived from the underlying hard rock basement. Although having accumulated in the arid to hyper arid central Namib, these sands that form the dunes originated in central South Africa in the catchment areas of the Orange River and its main tributary, the Vaal River. Three contrasting “conveyor belt systems,” acting in unison, namely, the Orange River, a coastal long-shore drift and the coastal onshore winds, finally deposited the sands in the central Namib. Thus, both Central Namib Sand Seas are displaced and aeolian derivatives of the huge inland Orange/Vaal River Basin.

But the Namib Sand Sea is not just made up of shifting, unconsolidated dunes or aeolian sheet sands. The bedrock to the two sand seas forms a gradually rising peneplain studded by occasional inselbergs. Westerly flowing rivers cut valleys into the Namib bedrock even before the first dunes sands were deposited. Subsequently, rivers flowing off the Great Escarpment in the east during summer rains deposited fluvial gravels from time to time within the accumulating aeolian succession. All these rivers still feed fresh rainwater into the old palaeo-valleys and extensively into the older semi-consolidated sand sea. This water is tapped to serve the harbour town of Lüderitz and supports shallow, fresh-water seeps at the coast. The water reaching the coast by this means is many thousands of years old.

The wind- and storm-generated long-shore drift has transported sand and marine gravels northwards along the coast. Past rises and falls in sea level have left diamond-bearing beach gravels inland of the present shoreline. Removal of fine sand by wind action over the millennia concentrated the diamonds into economical grades and old, derelict mining camps along the coast bear witness to the endeavours of hardy and determined fortune seekers in this harsh and unfriendly environment.

The peacefulness of a calm morning can be deceptive, because the dominantly southerly to southwesterly winds, which are responsible for slowly transporting the sand northwards, build up in the afternoon and keep blowing



well into the night. During storms, the flying sand is highly abrasive. However, by far the strongest winds are the katabatic east winds which are generated in winter when cold air from the sub-zero interior highlands flows westwards off the escarpment. The winds heat up and speed up as they cross the desert, stir up huge quantities of fine dust and reach temperatures of more than 30°C and speeds of up to 80 km/hr when they reach the coast. The resulting dust plumes extend as much as 200 km out to sea.

Apart from geology, the great fascination and importance to science of this harsh environment is the adaptation of nature to it. Fossils in the aeolianites reveal that conditions similar to the present prevailed as much as 21 million years ago. Vegetation, mammals, birds, reptiles and invertebrates all utilise the moisture from the regular coastal fogs generated by the cold Benguela Current as well as the occasional fresh-water seeps. Cape Fur Seals, tidal organisms and sea birds add to the variety along the coast. In the outer surf zone just south of Meob Bay, seepage of warm (fresh?) water up through the subtidal sands supports an isolated colony of the large warm-water shellfish *Panopia* that is a remnant of older warmer currents that hugged the coast in the past. The summer rains and flooding rivers that occasionally reach deep into the desert serve the same supportive purpose along the eastern edge of the central Namib. The depths of the unconsolidated dune sand is a cool refuge for invertebrates, reptiles and small mammals during the heat of the day when the sand surface can reach temperatures of 70°C.

The central Namib has been a haven for scientists studying the multitude adaptations and survival mechanisms of nature in the different climatic zones of the Namib. The region has become famous through numerous scientific publications but the wonders of the adaptability of life are also reaching the layman through visits by the public to the Desert Research Station at Gobabeb, through articles in newspapers and travel magazines and through the more accessible type of publications such as those of Louw and Seely (1982), "Ecology of Desert Organisms," and Kinahan (2001) "Pastoral Nomads of the Namib Desert."

A variety of tours through the dunes provide a once-in-a-lifetime experience for groups of adventurous tourists with extensive experience driving 4x4 vehicles. Such tours are lead by experienced, knowledgeable, environmentally conscious guides. Days of driving across one huge dune after another and down the slip faces, some as much as 40 m high, seeing the vehicle ahead as only a speck on the next dune, sleeping in relative shelter below slip faces and waking to the call of curious Pied Crows on a wind-still or wet, foggy morning leaves one with an unforgettable feeling of the magnitude, magnificence, beauty and the in-hospitable harshness of the desert, of the incredible survival mechanisms of its resident plants and creatures and with the privilege of having experienced all this.



Morphometry: Geography and Hydrography

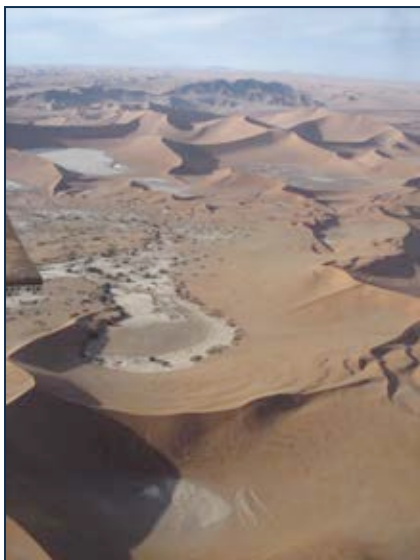
The Central Namib Sand Sea stretches from the northern border of the Sperrgebiet (Diamond Area 1) to the Kuiseb River and from the coast to the eastern boundary of the Namib-Naukluft Park but it excludes the Naukluft Mountains. This is the area nominated for inscription onto the World Heritage List. It already has special protection status and forms the bulk of the Namib-Naukluft Park, which is governed by Namibia's Nature Conservation Ordinance, No 4 of 1975. A modernised Parks and Wildlife Management Bill is currently in preparation.

The Central Namib Sand Sea covers 34 000 km² and is by far the largest area of almost continuous dunes in the whole of the Namib Desert. It has a maximum north-south length of 310 km and east-west width of 125 km. The dunes have been deposited on a bedrock bevel that rises gradually from sea level at the coast to between 800 – 1000 m inland. The accumulated sand is more than 200 m thick over large areas.

Precipitation of the coastal fog in the west can be double that provided by rainfall and is highest approximately 30-60 km inland from the coast. This supports a complex system of flora and dependent fauna (Louw and Seely, 1982). Occasionally, the eastern dunes are covered by an emerald-green coating of new grass after brief summer rains. But much more important are the westerly flowing rivers that flood after heavy rains on the escarpment and east thereof. The Tsauchab and Tsondab Rivers end in terminal pans deep within the dune belt. These hold



water for a short while after flooding. The water from all the westerly flowing rivers eventually disappears underground and feeds valley systems in the bedrock. This groundwater supports tourist lodges, guest farms and camp sites inside and just outside the border of the Namibia-Naukluft Park. The water in the deepest valleys ends up at the coast as fresh-water springs or shallow seeps at Anichab, Reutersbrunn, Fischersbrunn, Conception Bay and Sandwich Harbour. Fossil reed beds (*Phragmites australis*) at Reutersbrunn and Conception Bay indicate that this has also been the case in the past. At the southern edge of the sand sea and half way to the coast, fresh water for Lüderitz is pumped from one of these deep bedrock valleys in the Koichab Pan area. The Kuiseb River, with its source in the centre of Namibia, forms part of the northern border to the area nominated for inscription onto the World Heritage List. It floods almost annually and prevents the dunes from encroaching on the gravel plains to the north. Nevertheless, the Kuiseb River has only reached the sea twice in recent times, namely in 1934 and 2011.



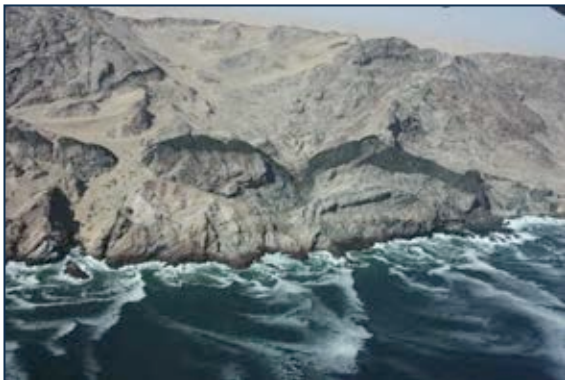
Morphology: global and southern African perspectives

The sand sea system of the central Namib Desert is the largest area of continuous dunes in the world and is located in the west coast continental rain shadow. It is an outstanding and probably the most unique example of interlinked fluvial, marine and aeolian interaction. It has been active for at least

21 million years and is still accumulating dune sand. Transported initially to the west coast by the Orange River, north-directed longshore drift in the littoral and sublittoral zone and the high-energy and persistent southerly to south-westerly winds finally convey the sands into the central Namib. Although the dune environment of the central Namib is arid to hyper arid, fog from the cold coastal Benguela Current in the west and occasional summer rains and flooding rivers in the east have supported incredible and interlinked ecosystems of hardy, desert-adapted fauna and flora, from the tiniest microbes to large antelope and long-lived acacia trees.

Morphology and Geology: the unique details

Morphology



The Central Namib Desert consists of a bedrock peneplain that rises from sea level at the coast to an elevation of 800-1000 m at the eastern edge of the dunes. This bedrock is exposed periodically along the coast, in a large area between Conception Bay and Meob Bay, in inselbergs in the Uri-Hauchab, Hauchab and Awasib Mountains in the southern half of the dune field and along the eastern edge of the dunes. Such inselbergs are conspicuously absent in the northern half of the dune field.

Two readily distinguishable sand seas make up the Central Namib Sand Sea. These were deposited one on top of the other on the Namib bedrock peneplain. The older sand sea, the Tsondab Sandstone Formation, is deep red, semi-consolidated and underwent a process of partial cementation before the pale yellow to buff sands of the younger, still unconsolidated sand sea, the Sossus Sand Formation, were deposited on top. The Tsondab Sandstone crops out sporadically between the Sossus Formation sands, and also forms spectacular aeolianite cliffs on the farm Dieprivier 403. This formation is even more widespread than the overlying sands (Ward, 1987, 1988) but is largely obscured by the latter.



Cliffs of Tsondab Sandstone Formation aeolianite on the farm Dieprivier 403. Thick units are single cross-bedded dunes; thin units are roughly horizontally bedded interdune bounding surfaces (from Miller, 2008).

The unconsolidated dune sands of the Sossus Formation are responsible for the spectacular scenery of the Central Namib Desert. The dune types change from north to south and from east to west. Each dune type or dune pattern is fascinating and very attractive when viewed from above but the most spectacular are the stellate or star dunes in the west, the saw-tooth dunes bordering the lower Tsauchab River valley, and the pyramid dunes in the southeast.

The coast is rocky in places with small cliffs here and there, or exposures of pre-Tsondab basement rocks of varying width separating sandy beaches from the dunes. Stretches of salt pan also separate either coastal outcrops or sandy beaches from the dunes, as from south of Douglas Point to Hottentot's Bay, from Reutersbrunn to Conception Bay and just south of Sandwich Harbour. But the nature of the coast varies continuously. In places, aeolian sheet sands with small, superimposed barchan dunes or vegetated hummock dunes rise gradually from the shore to the first north-trending linear dune. In contrast, between Saddle Hill and Saddle Hill North, between North Point and Knoll Point, in the St. Francis Bay area and north thereof almost to Reutersbrunn, and between Conception Bay and the southern tip of the Sandwich Harbour salt pan, slip faces of high dunes occur on the shoreline, are eroded by the high-tide surf and can rise to an elevation of 50 m or more above sea level within 300 m of the shore.

The estimated combined thickness of the two superimposed sand seas reaches a maximum of 475 m, with average thicknesses varying between some 150 m and 290 m from south to north.

Educational and scientific value

The Tsondab and Sossus Sand Seas of the Central Namib Desert have been the subject of a number of geological, geomorphological and palaeontological studies, the latter still ongoing and continuing to add to our knowledge database with new discoveries. The westerly flowing rivers replenish subterranean reservoirs that are utilised for the water supply for the town of Lüderitz and for the increasing number of lodges and camp sites along the eastern edge of the Central Namib Desert. Archaeological surveys show that even deserts can be occupied for brief periods when rainfall is abnormally high. By far the greatest contribution to our understanding of the desert has come from the biological sciences in numerous studies of what lives in the desert and how it survives. These all help us to understand the evolution of and adaptation to some of the harsh environments of our planet. The desert is spectacular and tourism through the Sossus Sand Sea and along its eastern margins, much intentionally ecologically orientated, continues to gain momentum but in a controlled fashion so as to limit impact to an absolute minimum. Through this tourism, large numbers of people are learning about the desert and adaptation of organisms to this arid to hyper-arid environment.

Evolution of the southwestern coast of Africa and the Namib Desert Sand Sea

The understanding of geological processes that have led to the evolution of the present Namib Desert Sand Sea requires an understanding of plate tectonic processes that have shaped the past and present face of the Earth. The geological units underlying modern Namibia initially formed part of the older supercontinents Rodinia and Gondwana.

From supercontinent to the Namib bedrock bevel

The bedrock, upon which the dunes rest, records several major phases of crustal evolution relating to the amalgamation and breakup of the Rodinia and Gondwana Supercontinents (Miller, 2008). Outcrops occur sporadically along the coast, in a few inselbergs within the dunes and along the eastern border of the dune belt. The largest coastal outcrop area is the one between Conception Bay and Meob Bay.

The oldest rocks are the high-grade metasediments, metamorphosed volcanic rocks and ortho- and paragneisses of the NW-trending Namaqua Metamorphic Complex. These record one of the main stages in the accretion of Rodinia 1200 million years ago. They crop out on the southern edge of the dune field, and in the Uri-Hauchab and Hauchab Mountains in the centre of the dune field. Time equivalent to these deep-crustal rocks are supra-crustal, active continental margin volcanic and sedimentary rocks and associated sub-volcanic intrusive plutons of the Sinclair Supergroup with ages of between 1400 and 1100 million years and which occur all along the eastern margin of the dune belt. The Excelsior-Lord Hill Shear Zone forms the suture between the Namaqua and Sinclair sequences. It is the site of the former subduction zone that separated them and stands out exceptionally well on aeromagnetic maps, even below the cover of the dunes (Miller, 2008).

Intracontinental rifting along NE and N-S trends initiated break up of Rodinia and the start of deposition of the Neoproterozoic Damara Supergroup in this part of Namibia between 900 and 800 million years ago. Evolution from rifting to continental breakup and separation saw the development of a deep north-south trending ocean to the west joined to a northeast-trending ocean that extended across central Africa. Rift arkoses and shelf carbonates occur in the Saddle Hill area, and thinly bedded, continental rise turbidites are found in the Conception Bay area. In the area between Conception Bay and Meob Bay, a thick succession of deep-water, turbiditic greywackes with a few interbedded basalts was deposited. Reversal of plate motion saw the gradual closure of these oceans, continental collision and the formation of the next supercontinent, Gondwana. Intense NW over SE transposition of South America over Africa thrust the arkoses and carbonates in the Saddle Hill area onto the gneisses of the Namaqua Metamorphic Complex. In the area between Conception Bay and Meob Bay, granite intrusion and high-temperature metamorphism transformed the greywackes into a huge, partially molten migmatite complex which covers an area in excess of 300 km². Deformation of the migmatite remixed molten and un-molten (restite) components and enabled some of this remixed material full of restite fragments to intrude as small plugs (Miller, 2008; Miller et al., 1975). This huge area of remixed migmatite may be unique in the world. Further study of this gigantic migmatite mass will certainly advance our understanding of the way in which granite melts separate from their unmolten residue. Difficulty of access has been the major deterring factor to research on these rocks to date.

The next major geological event was the plume-driven volcanism of the early Cretaceous Paraná/Etendeka Large Igneous Province with its voluminous and rapidly erupted basalts and quartz latites. No basalts or quartz latites occur in the Conception Bay – Meob Bay area but there are dolerite dykes with Etendeka basalt chemistry. The Paraná/Etendeka volcanism occurred just prior to breakup of the South American/African part of Gondwana and the start of the formation of the present South Atlantic Ocean at about 128 million years ago.

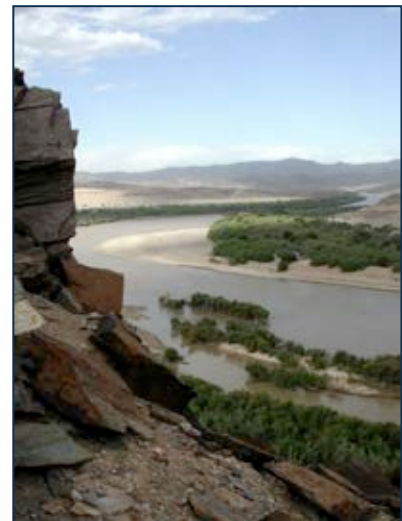
Erosion by means of escarpment retreat under hot, humid conditions followed and lasted approximately 60 million years, almost to the end of the Cretaceous. This erosion produced a Namib-wide bedrock bevel or peneplain, which stretches the full north-south length of Namibia's west coast and extends from sea level in the west to an elevation of 800 – 1000 m at the eastern edge of the central Namib dunes. Inselbergs of Namaqua and Sinclair rocks, such as the Uri-Hauchab, Hauchab and Awasib Mountains, dot this bevel in the southern half of the dune field and along its eastern edge but are conspicuously absent in the northern half.



A sea-level fall of 120 m or more during the Oligocene (Dingle et al., 1983), accompanied by increased rainfall in western Namibia, changed the erosional base level inland significantly. Deep, V-shaped valleys were cut into the Namib bedrock bevel by westerly flowing rivers. At the same time huge areas of the offshore sediments were exposed to the southerly to southwesterly wind regime of the coast. As sea level rose again, the V-shaped valleys filled rapidly with river gravels, but the valleys themselves continued to serve and still serve as conduits for groundwater all the way to the coast (Miller, 2008). Fossils in fluvial-palustrine deposits in the northern Sperrgebiet and just south of the Central Namib Sand Sea suggest that this pre-sand-sea fluvial phase ended at about 21 million years ago (Mourer-Chauviré et al., 1996a, 1996b).

Accumulation of the two Namib ergs and the associated fluvial and marine deposits

The Orange River system has been in existence since the early Cretaceous transporting sediment westwards. It built out a huge delta in the widening South Atlantic Ocean throughout the Cretaceous and the Cenozoic (Dingle et al., 1983; Muntingh, 1993; Muntingh and Brown, 1993; Brown et al., 1995). The river mouth and the delta are located in an area where almost continuous and often powerful southerly winds of the South Atlantic Anticyclone drive a vigorous longshore drift that transports gravel, diamonds and sand for hundreds of kilometres northwards and back onto the beaches of the Namibian coast (Dingle et al., 1983; Jacob et al., 1999; Jacob, 2005; Bluck et al., 2007). The diamondiferous gravels of the Orange River and the Namibian raised beaches contain pebbles that can be traced to very specific formations deep in the South African interior (Stocken, 1962; Jacob, 2005). The same powerful southerly winds blew and still blow the sands back onshore, often along well defined sand-transport corridors, and have built up both sand seas over millions of years (Rogers, 1977; Corbett, 1989, 1993).



It was during the early Miocene about 21 million years ago that the first aeolian sands of the Central Namib Desert began to accumulate onshore (Pickford and Senut, 1999; Pickford et al., 1995). With the strengthening of the cold Benguela Current about 16 million years ago, these eventually covered the full length and breadth of the Namib Desert from the Orange River to the Kunene River and from the coast to the valleys in the foothills of the escarpment (Ward, 1987, 1988; Ward et al., 1983). These consolidated to form the first Namib erg, the Tsondab Sandstone Formation. Subsequent erosion has removed most of this aeolianite north of the Kuiseb River but it is still extensively preserved beneath the unconsolidated dune sands of the Sossus Sand Formation in the Central Namib. The Tsondab aeolian sands are interbedded with escarpment-sourced fluvial sands and gravels along the eastern edge of the sand sea (Ward, 1988). Periodic flooding of long-lived depressions in the Tsondab aeolian sands enabled laminated deposits of white limnic limestone to accumulate, the Khommabes Carbonate Member. Kasts of gypsum crystals in these carbonates point to desiccation that followed good rains (Ward, 1987, 1988).



The partial cementation of the Tsondab deposits was completed towards the end of the Miocene. During a prolonged period of higher summer rainfall that followed, flood waters of the main westerly flowing rivers cut broad but rather shallow river channels into, but not through the Tsondab Sandstone and deposited westward-fining river gravels in these valleys to within 25 km of the coast, the Karpfenkliff Formation of the palaeo-Kuiseb, -Tsondab and -Tsauchab Rivers (Ward, 1987; Hoffmann et al., 1994). The valley gravels and the underlying sandstone gradually became cemented by calcrete that precipitated from groundwater which continued to flow in these valleys long after gravel deposition had ceased (Miller, 2008). Some of the most spectacular outcrops of these late Miocene, calcrete-cemented gravels are in the Sesriem Canyon (Schneider and Marais, 2004).

The Karpfenkliff gravels of the palaeo-Kuiseb River crop out between regularly spaced transverse dunes but there are almost no dunes on the gravels of the other two rivers. The valley of the palaeo-Tsondab River is the best exposed and readily recognisable between the high valley flanks for 80 km from the eastern edge of its gravel plains where it is 25 km wide to 35 km northwest of Tsondabvlei where it is only 2 km wide. A narrow strip of dunes separates the Tsondabvlei from the exposed western 30 km of this palaeo-valley. The Karpfenkliff gravels of the Tsauchab River are exposed all the way down to Sossusvlei. This palaeo-valley is not at all obvious as the high flanks of this older valley are completely covered by dunes of the Sossus Formation, saw-tooth dunes down the valley flanks and onto the valley floor, and stellate dunes on top of the valley flanks.

The aeolian sands of the second Namib erg, the unconsolidated, Pliocene to present-day Sossus Sand Formation, were and are being fed but trains of fast-moving barchan dunes that arise at beaches with northwesterly orientations as far as 300 km south of the Central Namib Sand Sea. These trains define sand-transport corridors, traverse an intensely sand-abraded coastal deflation basin (Corbett, 1993) and, under the influence of winds with speeds at times exceeding 100 km per hour, feed into the southern end of the Central Namib Sand Sea just northeast of Lüderitz, from whence that sand is gradually transported northwards and northeastwards to form the whole Sossus Formation sand sea. The heavy mineral suites in both the Tsondab and Sossus Formations are identical to those of the Miocene and present-day fluvial sands of the Orange River (Rogers, 1977). Through aeolian abrasion, the Sossus Formation feeds off the Tsondab Sandstone to a limited extent, so much so that the younger aeolianites become a deeper red in colour towards the east.

The present Tsondab and Tsauchab Rivers have cut new channels into their old palaeovalleys and their end points are the Tsondabvlei and Sossusvlei, respectively. Several deposits of white, calcareous pan clays in the Sossusvlei area occur at elevations up to 2-3 m above the present level of the Sossusvlei clays and are underlain by unconsolidated aeolian sand. These show that the Tsauchab River has cut its channel gradually deeper with time and that the location of its end point has not always been exactly where the present vlei is. In contrast, the Kuiseb River cut its present channel through the Tsondab Sandstone and deep into the underlying bedrock. This difference in behaviour of these rivers is due entirely to the size of their catchment areas and to the amount of rainfall in these areas. The two southerly rivers, the Tsondab and Tsauchab, have relatively small catchments in the escarpment region, where rainfall is considerably less than in that of the much larger Kuiseb River catchment further to the northeast. Floods in the Tsondab and Tsauchab Rivers only reach



their respective end points occasionally, but the Kuiseb River floods reach far into the desert almost every year. These floods take any dune sand that has blown into the river bed with them and thus prevent the dunes from crossing the Kuiseb River and spreading out onto the gravel plains to the north.

Over time, oscillating sea levels, driven by alternating global glaciations and warm periods, in combination with long-shore drift, deposited marine and marginal marine sediments and diamondiferous littoral gravels on the Namib bedrock bevel up to 30 km inland of the present coastline. Eocene beach gravels were deposited up to 170 m above the present sea level (Siesser and Salmon, 1979; Miller, 2008). Similarly, sea-level falls of as much as -120 m or more during the Oligocene (Dingle et al., 1983) deposited diamondiferous littoral gravels well west of the present coast and exposed huge areas of the offshore Orange River delta and the continental shelf north thereof. Thus, large areas of the Cretaceous and Cenozoic fluvio-marine sediments in the delta and on the continental shelf were exposed to the strong southerly winds for long periods of time and were huge sources of sand for the two central Namib sand seas.

Such raised diamondiferous beaches were exposed in the central Namib only in the Saddle Hill area and between Conception Bay and Meob Bay.

Palaeontology

The strata in the Namib Desert contain a rich and diverse fossil record which has proved to be useful for determining the timing of events in the desert and aspects of its palaeoclimate and palaeoenvironment.

The Neogene aeolian strata in the Namib Sand Sea contain interbedded marine, fluvial, lacustrine, plaudal and pedogenic deposits. Near the coast there are interbeds of marine deposits up to 50 metres above present-day sea-level, and these strata often contain rich marine faunas (bivalves, gastropods). Fossils have been found at numerous points throughout the Namib, and these have permitted the age of the various deposits to be ascertained within reasonable limits, using biochronology (age determination of strata using fossil mammals). The fossils also allow aspects of the palaeoenvironment to be determined (Pickford and Senut, 1999).

During the Early Miocene, some 21-19 million years ago, the region was semi-arid with savannah and steppe vegetation. By 16 million years the Namib Desert had become hyper-arid, with extensive deposition of aeolianites. Desert conditions have prevailed ever since, although there is evidence that there were periods of slightly greater humidity during which rivers flowed, lakes formed and calcrete crusts developed far into the desert.

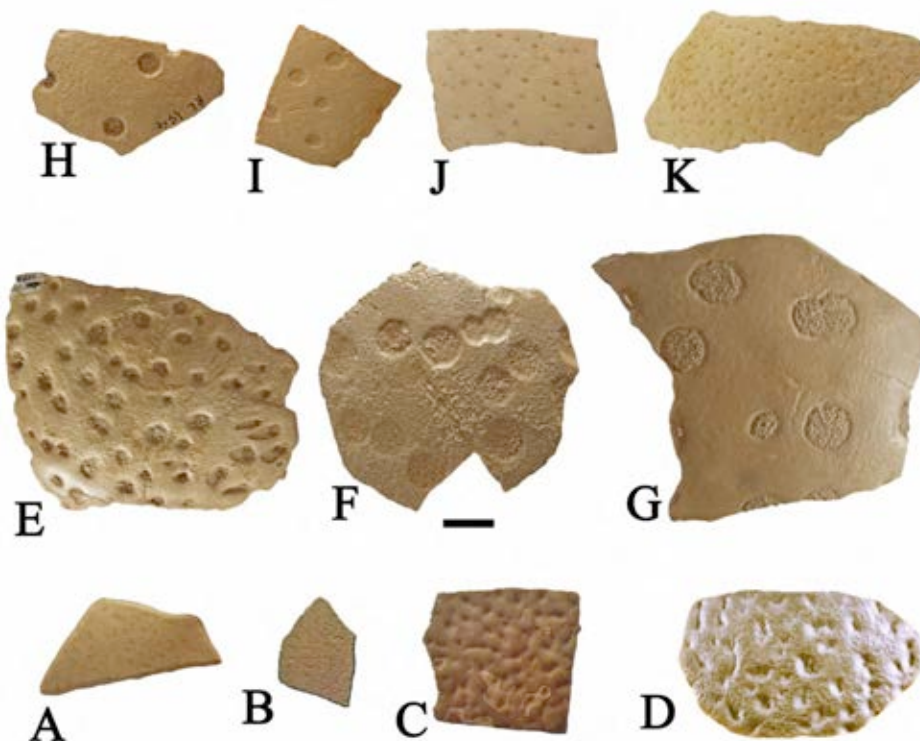
The Namib fossil record comprises three major classes of fossils – trace fossils (ichnofossils such as burrows and foot prints), bioconstructions (fossilised spider webs and termite hives for example) and body fossils (remains of invertebrate shells, vertebrate skeletons and eggshells).

Trace fossils are ubiquitous and abundant throughout the desert, particularly rich deposits being known near the coastal strip at Meob, where carnivore and ruminant foot prints are well preserved and common. Elsewhere traces of termite activity, coleopteran burrows, rhizoliths and other kinds of bioturbation are widespread and attest to the fact that the desert supported a rich and diverse fauna and flora throughout its existence. Well preserved trails of the Golden Mole *Eremitalpa* (largely an insectivore) and burrows of lizards and rodents are locally common in the aeolianites,

especially near Awasib. In places, narrow burrows made by termites and ants are preserved. Rhizoliths of various diameters reveal the former presence of grass and trees in the desert.

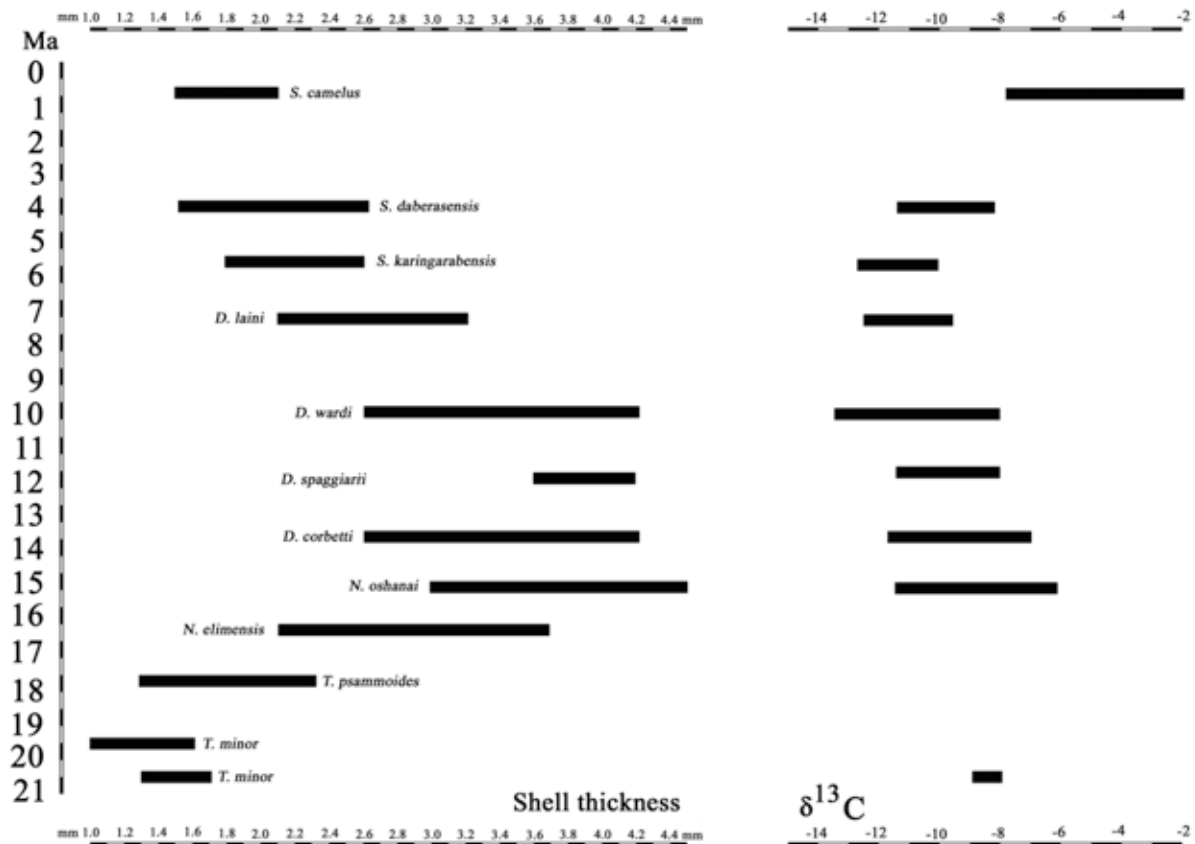
Bioconstructions are varied and widespread in the aeolianites of the Namib. The commonest kind of bioconstruction comprises latrines and hives of termites, notably the sand termite *Psammotermes*, and the harvester termite *Hodotermes*. The latter taxon denotes the installation of semi-arid climatic regimes in the Namib from time to time, as it requires summer rainfall in amounts greater than 250 mm per year. Perhaps the most unusual bioconstructions preserved in the Namib are roof webs of the « buck-spool spider » *Seothyra*, a genus that prepares a four-lobed trap door of thick web which has been found fossilised in various places in the desert, including Sossusvlei and the Tsondab Flats (Pickford, 2000, 2008).

Body fossils are of particular interest to the palaeontologist as they yield information concerning the ages and palaeoenvironments of the deposits. Fossil rodents and carnivores found at Sossusvlei, Awasib, Tree Pan, Meob and elsewhere form the basis for estimations of the age of the sediments in which they occur. Fossil struthious eggshells, which are abundant in the aeolianites, are notable for the variation in shell thickness and surface morphology that they demonstrate. Careful note of the stratigraphic context of the eggshells and their associated mammalian fossils has permitted the erection of a biostratigraphic scale based on eggshells (Pickford et al., 1995 ; Pickford, 2009 ; Senut and Pickford, 1995 ; Senut et al., 1995). Some of the types of eggshells that occur in the Namib have subsequently been reported from Malawi, Tanzania, Kenya and the United Arab Emirates and in every case, the estimated age of the strata deduced in Namibia has been confirmed. The fact that the eggshells span the period 21 million years to the present is particularly useful, as they cover the entire history of the Namib as a desert. Detailed mapping of the aeolianites is now possible using eggshells as a chronometric tool. Preliminary mapping reveals that the details of sedimentation are more complex than hitherto thought possible.



Succession of fossil eggshell types from the Namib Desert (A oldest to K youngest). A) *Tsondabornis minor*, B) *Tsondabornis psammoides*, C) *Namornis elimensis*, D) *Namornis oshanai*, E) *Diamantornis corbetti*, F) *Diamantornis spaggiarii*, G) *Diamantornis wardi*, H) *Diamantornis laini*, I) *Struthio karingarabensis*, J) *Struthio daberansensis*, K) *Struthio camelus* (scale – 10 mm).

The fossil eggshells retain faithful copies of carbon and oxygen isotopes that they had when they were laid, and this permits aspects of palaeoclimate and palaeoecology to be determined.



Variation in eggshell thickness and $\delta^{13}\text{C}$ values of fossil eggshells from the Miocene of Namibia. There is an inverse correlation between the two trends, with thicker eggshells tending to have lower $\delta^{13}\text{C}$ values than thin eggs ($\delta^{13}\text{C}$ values from Ségalen et al., 2002).

Among the mammalian fossils found in the Namib, rodents predominate, in particular Pedetidae (Spring Hares) and Muroids (mice and rats). The Pedetidae underwent significant evolution during the past 21 million years, with increase in hypsodonty (increasing height of the cheek teeth), addition of cementum on the cheek teeth, and eventually the suppression of roots, meaning that the teeth grow throughout the life of the individual. The spring hares are thus useful for biochronology.

Rarer in the Namib are fossils of proboscideans (elephant relatives), aardvarks, bovids (ruminants), equids (zebras) and carnivores (hyaenas, meerkats) but each occurrence yields information about palaeoenvironments and age. Thus, the Kamberg Calcrete, which is widespread in the northern part of the Namib, can be dated to the Pleistocene on the basis of the equid and bovid fossils it contains, whilst they also indicate that there was an extended period of semi-aridity with over 250 mm of rainfall annually. The calcrete also contains stone tools, suggesting that humans were able to survive in the desert during these remote periods.

Recent slack-water deposits associated with the Kuiseb River contain abundant human and animal foot prints.

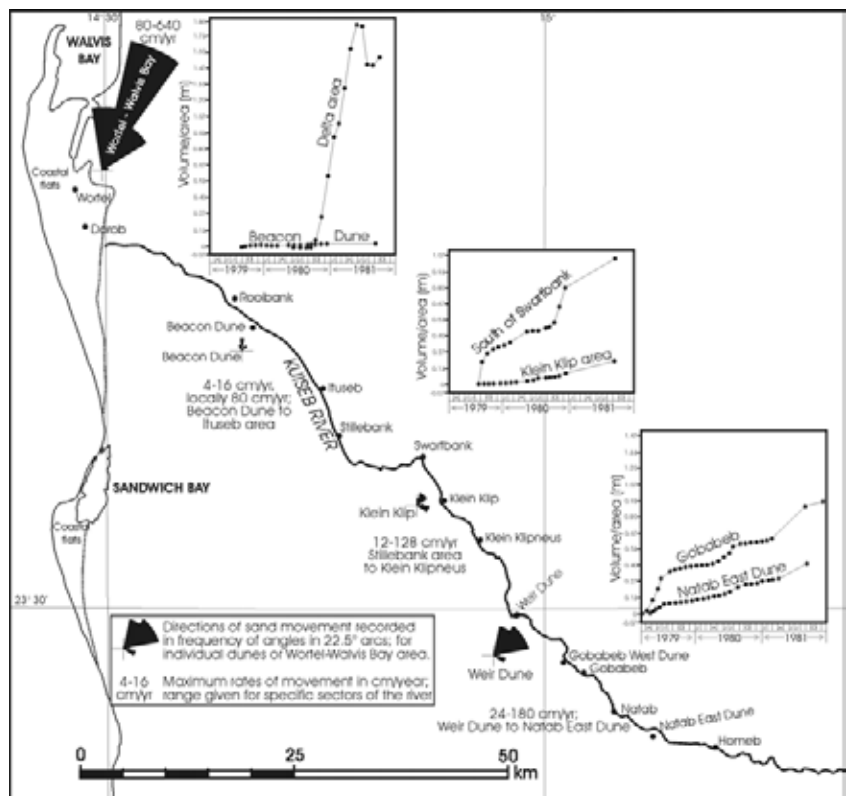
Thus far, little palaeontological research has been focussed on the Namib Desert. The main areas studied have been Sossusvlei, Tsondab Flats, Awasib and Meob, all of which are near the edges of the desert. Transects across the desert in the Uri-Hauchab area reveal that fossils probably occur throughout the desert, and it would be well worth spending more time and energy on a survey of the region because fossils hold the key for unravelling the detailed history of the Namib Desert (Ségalen et al., 2002; Senut et al., 2009).

The work done thus far reveals that the Namib Desert became hyper-arid about 16 million years ago at the same time that the Antarctic Ice Cap expanded to cover the entire Antarctic continent. A change in the fauna occurred about 8-7 million years ago, at the same time that aeolian cross-bedding shows evidence of the onset of east winds (berg winds) in addition to the prevailing south winds that have dominated Namib history throughout the Neogene. The onset of berg winds coincided with the growth of the Arctic Ice Cap in the Late Miocene. The installation of hyper-arid conditions at the base of the Middle Miocene and the subsequent modifications in climate of the Namib Desert were thus intimately connected to polar ice cap history. The Namib fossil record accords with this deduction, and the stable isotope studies on struthious eggshells complement the evidence from ocean cores.

Sand transport, sand thickness and dune types

The main wind directions are southerly along the coast and southwesterly further inland but there are occasional strong northwesterly and easterly winds. The overall movement of sand is consequently to the north or northeast. The greatest rate of movement is along the coast where the southerly wind blows rather strongly most afternoons and evenings. Longitudinal dunes prevail in this region. Changes in wind direction alter the facing direction of the dune crests. On the eastern edge of the Sossus Sand Sea, the wind direction is more variable from day to day. Consequently, this is the region where multi-crested stellate and pyramid dunes are developed.

The uniqueness of both sand seas lies in the fact that they are quite different from other large sand seas elsewhere in the world, as they have not been derived from the hard, underlying bedrock on which they lie. The sands originated deep in the wet interior of South Africa in the large catchment area of the Orange/Vaal Basin.



Rates and directions of movement of aeolian sands of the Sossus Sand Formation along various reaches of the Kuiseb River (from Miller, 2008, modified after Ward, 1984).

Both sand seas are, therefore, outstanding and unique examples of the interaction of a major river system draining into a highly dynamic coastal environment in which some of the most intense winds on earth drive a powerful littoral and sub-littoral long-shore drift system which transports the offshore fluvial sediments northwards and back onto beaches. The winds pick up the sands from the beaches and carry them northwards and northeastwards to form the dunes.

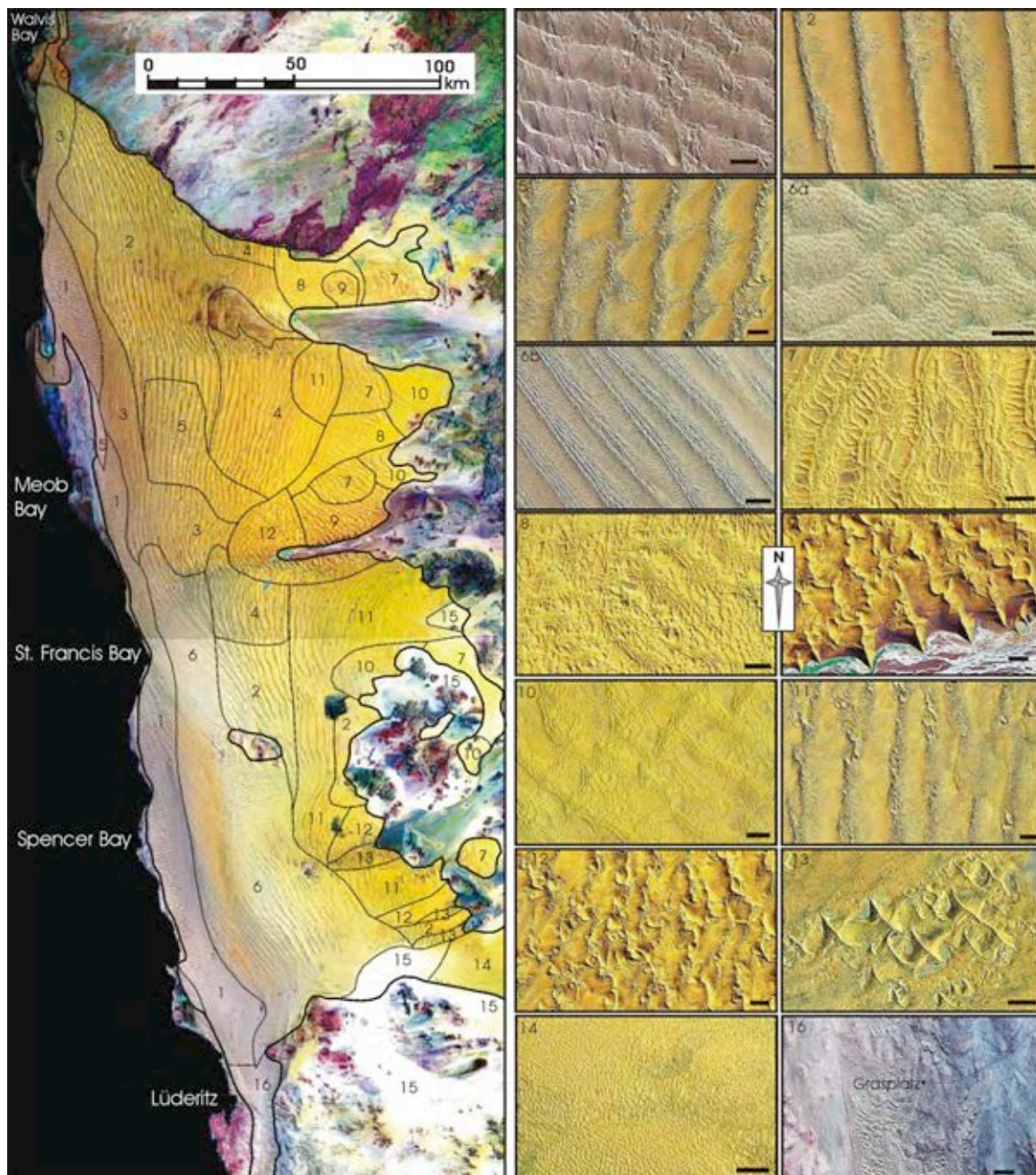
Traverse location	Estimated average combined thickness; number of measured points along traverse where thickness >110 m; total number of measured points	Distance from coast over which average thickness was calculated for point thicknesses >110 m	Mid point of traverse over which average thickness was calculated; km from coast	Maximum individual thickness along traverse in m; distance from coast
23° 47'S	147 m/9/9	From 15 to 125 km	70 km	200m/119 km
24° 10'S	195 m/6/10	From 59 to 134 km	97 km	250m/59km
24° 30'S	290 m/7/8	From 41 to 107 km	74 km	475m/87km
24° 53'S	244 m/9/9	From 12 to 104 km	58 km	300/45, 58 & 81km
25°S	150 m/6/9	From 8 to 50 km	29 km	180m/25km

Estimated combine thickness of the Tsondab Sandstone Formation and Sossus Sand Formations ergs from south to north

The table above shows the average combined thickness of the two ergs along five east-west traverses. The combined thickness increases northwards to 24° 30' S then decreases north of that. The maximum estimated thickness of 475 m is on this traverse. The mid point of the thickest group of measurements is located progressively further inland from 25°S to 24° 10'S but is not quite so far inland in the next traverse.

The main dune types are transverse dunes in a coastal strip, linear dunes in the centre of the sand sea and star dune systems in the east but many more dune types are also present. Superimposed on the false-colour Landsat image below are the areas in which Besler (1980) identified the different dune types. Bar scale on Landsat images of the various dune types is 2 km: 1 – transverse or compound crescentic dunes, 2 – longitudinal ridges or linear dunes, 3 – transition forms between transverse and linear dunes, 4 – branching longitudinal ridges or linear dunes, 5 - network complex within the linear dune system, 6a – zibar dunes, 6b - zibar-silk dune system, 7 – lace dunes, 8 – honeycomb structure, 9 - honeycomb structure with stellate dunes and saw-tooth dunes on the northern flank of the Tsauchab River valley, 10 – giant honeycomb structure, 11 – warty dune ridges with stellate dunes, 12 – high chaotic dunes, 13 – pyramid dunes, 14 – dune sand plain with craters, 15 – sand sheets with or without coarse-grained sand or granule sand waves; 16 - aeolian transport corridor with barchanoid dunes (Aus-Lüderitz road just SE of Lüderitz visible in the enlargement of the corridor).





Dune types of the Central Namib Sand Sea (after Miller, 2008; based on Besler, 1980)

Natural Resources

The conditions in the area are difficult beyond description. The south-westerly storms allow work only on a limited number of days, and then only between 5 and 10 am, or maybe 12 am, after that the wind is so sand-laden that living creatures cannot be exposed to it. One can only admire the tenacity and the amount of energy that these prospectors are prepared to put in, and I really found the stories told about this desolate terrain to be true. If one has not seen it with one's own eyes, the conditions are, in the true sense of the word, unbelievable.

Dr FW Voit, Government Geologist, 1910

The only minerals that have ever been mined in the area nominated for inscription onto the World Heritage List are diamonds. While the famous and rich Namibian diamond deposits occur to the south, the area of the Central Namib Sand Sea contained economically less important accumulations of smaller stones which supported small-scale operations in the past. However, extensive research into the formation of the Namibian diamond deposits has also resulted in the generation of knowledge about the age, formation and general geology of the Central Namib Sand Sea. Some of this research work might not have been undertaken, had it not been for the diamonds.



When diamonds were first found in 1908, their mode of occurrence in the desert was strange and hitherto unknown because diamonds had always been associated with kimberlites, and not with sediments.

Namibia's Diamond Coast extends from the Orange River to the Kunene River and includes the area where the Central Namib Sand Sea meets the Atlantic Ocean. The Namibian coastal diamonds have been sourced from deeply eroded kimberlites in the interior of southern Africa in the huge catchment areas of the Orange and Vaal Rivers.

After being separated from their kimberlite hosts, the diamonds were subjected to a process of intense abrasion, as the river sands, boulders and diamonds were reworked again and again during flooding on their more than 1000 km long journey to the Orange River delta on the Atlantic coast. The long-shore drift took over the northward transport of the deltaic sediments and diamonds, mainly during coastal storms. The diamonds were, thus, further pounded by the boulders and pebbles before being finally deposited in pebbly beach placers. Only the best gems, without



inclusions, flaws or other imperfections in their crystal lattice were able to survive this ordeal. For this reason, Namibian diamonds are the best and most highly priced gems in the World. A total of 95% of Namibia's diamonds are gem quality. By comparison, only 25-35% of the diamonds in an average kimberlite pipe are gem quality.

Over the last 3 million years, rises and falls in sea level associated with past glacial and interglacial periods resulted in the deposition of several linear diamondiferous beaches or small pocket

beaches in small embayments along the coast, some above and some below present sea level.

The diamonds occur within one of the highest energy aeolian systems on Earth. Linear valleys extending northwards from the south-facing embayments in the coastline trapped diamondiferous marine sediments when sea levels were higher than at present. These valleys have in the past and are still swept by winds with speeds exceeding 100 km per hour at times. The winds transport enormous amounts of sand and effectively separate fine-grained and light material which is blown away from a deflation lag of coarser granules, pebbles and heavy minerals which remains in the valleys. Such aeolian winnowing left a thin, much higher grade deposit of diamondiferous gravel on the bedrock. Heavy mineral particles, such as diamonds, preferentially concentrate in the wind

shadow of rocky obstacles. By a process of aeolian bedload creep, very coarse grains of sand gradually accumulate to form coarse-grained sand waves up to 0.5 m in height. The finer diamonds are moved by the same process and can end up in such sand waves.



A chaotic rush to the southern diamond fields followed the discovery of the first diamond east of Lüderitz in 1908. Soon afterwards, the secretary of the colonial administration – Namibia was a German colony by then – visited the colony as the German government was keen to secure a share in the lucrative diamond business. On 22 September 1908 he proclaimed the area between 26° south and the Orange River, and from the coast to a line 100 km inland off limits for diamond prospecting. The sole rights were given to the German Colonial Company for Southwest-Africa.



In the colony, the news was received with disbelief, dismay and anger. The outraged prospectors were now forced to look at the Central Namib Sand Sea north of Lüderitz, as the door to the southern diamond fields had been shut in their faces. Due to their perseverance, a mere three months after the proclamation, some prospectors negotiating the coastline in a cutter discovered the first diamonds at Spencer Bay. The first successful expedition from Lüderitz to Swakopmund

reported extensive diamond deposits along the coast, albeit only with 12 to 15 small stones to the carat. There soon was a constant stream of prospectors trekking northwards, and another diamond rush had set in. Against almost impossible odds, mining camps were established at Saddle Hill, Oyster Cliffs and on the Orloff fields. More diamonds were discovered between Meob Bay and Conception Bay in 1909. By 1910, virtually the entire area was pegged by prospectors. They formed small prospecting groups and worked northwards from Lüderitz and southwards from Swakopmund and Sandwich Harbour. By 1909, more than 5000 claims had been registered. But not everybody returned with diamonds, and an entire expedition vanished in 1909. Their bleached bones were found years later by other prospectors. Some of the adventures and misadventures of these prospectors are described by Schneider (2009) and Baericke (2007). The



first scientific expedition to the Central Namib Sand Sea started in August 1909, and succeeded in mapping the relationship of the desert terrain to the ephemeral rivers of the hinterland



It is difficult to imagine the hardship that both man and beast endured in the harsh desert conditions, with the cold, almost unending dunes, the ever howling southerly winds, the lack of shelter, and the shortage of water. One can only marvel at the pioneering spirit that must have prevailed.

Access to the “northern fields” – as the area became known – was by way of ox wagon, mules, horses and camels. The absolute lack of any human settlements in the area resulted in large quantities of fodder having to be distributed to various strategic points to feed the animals. The wheels of the ox wagons were fitted with wide iron bands to make transportation in sandy areas easier. Nevertheless, the oxen still had to endure incredibly harsh conditions. Today, old refuse dumps with their characteristic accumulations of horns bear witness to the thousands of oxen that were slaughtered over the years at the end of their faithful service.



Coming from the north, the prospectors met nothing but sand, salt pans and sea. The distance of 90 km started off with seven high dunes just south of Sandwich Harbour, including one which even at low tide required man, beast and carts to move through the sea. Next was the infamous “long wall”, where the slip faces of the dunes meet the sea, leaving only a narrow stretch of beach to negotiate. This stretch of beach is only accessible at low tide, and disappears completely during high tide. Failing to pass the entire stretch during low tide inevitably spelt disaster.

Transporting mining equipment and supplies was another logistical challenge. The cutter *Viking* and various other ships sailed from Swakopmund to service Conception Bay. They would unload their goods with the help of surf boats. The diggings further south had to rely on vessels from Lüderitz. Quite a few wrecks occurred, such as when the steamer *Eduard Bohlen* was beached and lost on 5 September 1909 at Conception Bay while intending to offload mining equipment. Lawlessness and claim “jumping” was a problem.



Prospecting and mining methods were primitive and without mechanisation. Sieving was done with primitive hand-held sieves or by trommel sieves. A number of hand-operated, moveable sieve jigs, including the famous Plietz jig, were used to concentrate the diamonds. Special wooden cases containing everything a one-man operation required, including sieves, a jig and a shovel, were shipped from Swakopmund.



A considerable amount of diamonds was produced. The average price received for the stones was 20 to 25 *Reichsmark* per carat. But the claims yielded fewer and smaller diamonds than those south of Lüderitz, only between 5 to 8 stones per carat, although the odd 0.5 carat stone was sometimes found. In the Meob and Conception Bay areas, the gravels were very patchy and on average the stones were even smaller, between 10 and 14 stones per carat. The tremendous logistical problems associated with

the northern fields and their inferior yields compared with the area south of Lüderitz made them much less attractive than was initially expected.

Notwithstanding this, by 1909, 16 companies operating on the northern fields were listed in the trade register and had a combined capital investment of 2.25 million *Reichsmark* and 583 claims. But the 33.5 % export tax imposed by the German imperial government meant that many prospectors faced bankruptcy. The situation eased somewhat in 1912 with the amendment of the taxation ordinance but cash flow remained a problem.



Systematic operations started in April 1913 after smaller operators had amalgamated into the “Diamantfelder Verwertungsgesellschaft Conceptionsbucht mbH” which then gave an option to the “Koloniale Bergbau-Gesellschaft” of August Stauch, the man who pegged the first diamond claims near Lüderitz and thereby initiated the first diamond rush. Prospecting trenches were excavated, and mules transported the sieved material in light cocopans to a washing plant. Some 108 loads of gravel were washed every day, yielding an average of 75 carats of diamonds. The total production for 1913 amounted to 15 167 carats. Removing the thick overburden of Aeolian sand was a problem in places.



Water and supplies delivered to Conception Bay by ship had to be transported by mules and camels to the individual fields. A narrow-gauge railway line for mule-drawn trolleys was therefore built. Potable water was found the east of Conception Bay and four wells were drilled and a windmill erected in 1913. This was piped 80 km through a 5-cm-diameter steel pipeline to Meob Bay. The pipeline consisted of 13 300 6-m lengths and had been imported from Germany. A telephone line was later laid parallel to the pipeline. But water still had to be transported to those fields that did not lie

adjacent to the pipeline. Large rolling vats, pulled by mules, were used for this.

Visitors to the mining areas remarked on their barrenness and dreadful isolation. Indeed, most prospectors and their workers were completely cut off from the World. They were accommodated in primitive wooden or corrugated iron huts or canvas tents. They also used the wreck of the “Eduard Bohlen” as accommodation. It is said that, at night, passing ships saw the eerie glow of fires gleaming from the portholes of the beached wreck.

In November 1914, following the outbreak of World War I, the northern diamond fields cease operations. Approximately 30 000 carats had been recovered by then. It was only in 1920 that the fields were re-opened again by Great Namaqua Diamonds (Pty) Ltd, which took over the rights of the “Diamantfelder Verwertungsgesellschaft Conceptionsbucht mbH” .



At Saddle Hill, South West Protectorate Diamonds Ltd started operating in 1922. Regularly spaced prospecting trenches were dug (these are still visible today) and systematic mining followed. The sediment was sieved in trommel sieves, and then washed in hand screens, before being hand sorted. On average, some 0.8 carats were recovered per cubic metre of gravel.



Supplies and mining equipment had once again to be shipped from Swakopmund to Conception Bay, a route that was usually served by the coaster “Ranza” which was cleared at Conception Bay with the aid of surf boats. Employees and some supplies were also transported from Walvis Bay to Conception Bay by mule- or horse-drawn carts. From 1923 onwards, motorcars were utilised on the fields. The first steam-driven Caterpillar arrived on the fields in 1930.

Over the years encampments with stores and workshop facilities were established at the “Grillenberger”, “Charlottenfelder”, “Holsatia” and “Fischersbrunn” fields. When water became scarce on the northern fields, the water pipeline was extended all the way to Fischersbrunn, where a natural source of fresh water, opened up by wells with winches, still exists today. There was enough water at Fischersbrunn to sustain an irrigation scheme which enabled the production of vegetables. Fig and peach trees were planted. Surplus produce was even shipped to Lüderitz and sold to hotels in Swakopmund. Some 6 ha were under irrigation. A bakery was later also installed.



Consolidated Diamond Mines (CDM) bought up many of the concessions but after a huge prospecting programme showed little result, it abandoned operations at the end of 1930. Namaqua Diamonds stopped operating in 1931, after having produced 135 461 carats of diamonds. At the same time the South West African Administration proclaimed the area as Diamond Area No 2 and closed it for prospecting and mining, as the authorities had experienced problems controlling this vast region. At that point total output from the northern fields amounted to some 579 734 carats



from the Conception Bay area and 14 763 carats from the Meob Bay area. A single diamond of 3.5 carats had been found and a few of 1 carat but the average stone size had remained small. Today, it is fascinating to walk through the dumps of deeply rusted machinery from these operations around Saddle Hill. The ruins of three mining camps can still be seen in the Conception Bay and Meob Bay areas. People left quickly and one can find cutlery, crockery, tools and other items of daily life at Grillenberger,

Charlottenfelder and Holsatia (Kohl and Schoeman, 2004).

In 1941, when diamond prices recovered, a new company, “Industrial Diamonds of South Africa” was floated. The Saddle Hill area quickly developed into a hive of mining activities, and large equipment was brought in along the beach and over the dunes. In the early 1950s, the production exceeded the quota that was given to the company by the Central Selling Organisation - the London monopoly that controlled all diamond sales worldwide at the time – and the surplus production was simply stored in glass jars at the mine! While production at Saddle Hill was expensive because of the remoteness of the area, the large demand for diamonds and the excellent prices paid after World War II enabled the company to make a healthy profit. However, the deposit was eventually mined out and mining ceased in 1963. In excess of 300 000 carats had been produced between 1941 and 1963.

Several prospecting campaigns were carried out in the area between 1951 and 1975 but without encouraging results. The area was de-proclaimed in the late 1980s and was included in the Namib-Naukluft National Park (Schneider, 2009).

Marine Archaeology

The coast of Namibia, including the coast of the Central Namib Sand Sea, is called the Skeleton Coast on account of the numerous shipwrecks that have occurred on this eastern Atlantic seaboard as well as because of numerous whale and occasional human skeletons that have been found on or just beneath the high-tide storm beaches. Since Portuguese pioneers embarked on their voyages of discovery along the African Coast to find a passage to India, sail ships were lost for various reasons.

Shipwrecks before 1800

It is known that Bartholomew Dias left Portugal with two caravels and one extra store-ship to enable his crew to extend their expedition far south along the African continent. Pedro Dias, a brother of Bartholomew was in charge of the store-ship with John de Santiago as pilot and John Alves as the Captain. The store-ship was left behind, probably at one of the bays called at between Walvis Bay and Lüderitz but old records and maps in Portugal do not specifically identify the exact bay in which although one might speculate that it would have been where fresh water was available. Only two ships are mentioned as being present on the historic occasion of the erection of the Padrão at Dias Point at Lüderitz (Axelson, 1973).



Nine months after leaving the store-ship behind, Dias was back with the proud record of having rounded the Cape of Good Hope, then known as the Cape of Storms. Only three of the supply ship’s crew of nine men, who were left behind as guards, had survived. One of the sailors, who was so weak from illness, died of joy at sighting his companions. The six other crew members, who tried to make contact with beachcombing natives on the main land, were brutally attacked and robbed of their possessions. The killing was observed from the store ship by the three remaining sailors. After removing the remaining food from the store-ship, Dias had it set alight and set sail to continue further north for home. This store-ship, from the year 1488, is thus the oldest recorded sailing ship wreck along the Namibian Atlantic Coast.

Documentation of shipwrecks along the Namibian Atlantic Coast before 1800 is virtually non-existent. Survivors perished along this inhospitable coast or were murdered by Strandlopers (local people living at places along the coast) who regarded them in all probability as intruders into their

territory. The majority of old shipwreck planks and beams along the coast are presumably of Portuguese origin from earlier times, as they used to sail along the Namibian Coast from Luanda to Cape Town and back. However, one must also take into account the many American whalers seasonally visiting the coast as from 1788, and here in particular the coast of the Central Namib Sand Sea. Some wreck remains were positively identified as American whalers. American made porcelain cups and saucers were also found and were later displayed in the National Museum in Windhoek. The Danish *Princess Caroline* was lost in 1755 opposite Meob Bay. A British East India Company ship rescued the survivors.

The wreck of the Dutch East India Company (VOC) ship *Vlissingen* remained a mystery for centuries. Eventually the archives in The Hague revealed that she had been lost in 1748 at Meob. There were 180 persons of 15 different nationalities on board, all of whom probably perished. "Duiten" coins from that wreck, dated 1746, were found spread from the Walvis Bay lagoon right down to south of Sylvia Hill and also in the Awasib Mountains, approximately 80 km from the coast in the southern Namib.

From Spain it is known that in 1789 the first sea battle along the Namibian Coast was fought against a Portuguese caravel. The Spanish ship was sunk in that battle off Sandwich Harbour.

Shipwrecks since 1800

In 1804 the American whaler *Hope* was lost just south of Sandwich Harbour. Except for two survivors who were rescued in the Sandwich Harbour lagoon, all crew members were murdered by Strandlopers. During the guano rush various sail ships were lost at or near Ichabo Island. These were the *Ann Mondell*, *Daphne*, *Eliza*, *Guernsey Lilly*, *Kate*, *Lord Keane* and *Orion*, to mention but some of the casualties. Lloyds of London lists them. From diamond diving prospectors it is known that at least three anchors were spread around the island and one near Post Office Point on the mainland. Judging from the various vessels lost in the area, and the fact that no ship wreckage can today be found, it can be presumed that the island people collected all fire wood they could find along the coast during guano collecting times. The masts were probably used as upright pillars for the current jetty on Ichaboe, since it dates from before the year 1900.



An interesting historical site is the cemetery at Douglas Bay. Up until the early 1950s, the names on the graves were still legible. Amongst the people buried here were also the captains of two ships. One was a certain MacKinnon. At another one of the graves, presumably also that of a captain, an old cannon was used as a grave stone. One captain was murdered by opponents in 1844/45 during a brawl while they were loading their ship with guano. Another cannon was observed between two graves which might have moved from its original position on a grave. It needs to be mentioned that in the absence of stones or bricks, old discarded cast iron cannons were often used as ballast on sail ships. The cannons reported at Ichaboe could thus be from a shipwreck of which the wood disintegrated or was removed for other purposes. At the height of the guano trade at Ichabo over 440 ships were lying at anchor. What a spectacular sight it must have been to see all the masts at sunset.

Whaling activities, hunting, mining, guano trade, increasing missionary activities, Swedish traders coming to the country, the introduction of steam on ships and finally the occupation of Namibia by Germany in 1884 resulted in a steady increase of shipping along the Atlantic coast and thus an increase in shipwrecks. The occupation of Walvis Bay by Great Britain also resulted in a monthly coaster connection between that port and Cape Town. Furthermore, the fishing activities of Cape Companies at Hottentot's Bay and Sandwich Harbour since 1850 resulted in a steady increase in the number of ships belonging to de Pass, Spence and Company sailing along the Atlantic Coast. The *Nantucket* and *Salem* whalers were also very active and places like Hottentot's Bay, Spencer Bay, Conception Bay, Sandwich Harbour, Walvis Bay, Cape Cross and a few places further north were used as intermediate stations to boil blubber. Huge cast iron blubber pots from Hottentot's Bay and Spencer Bay were moved after the World War I to Simonstown. Some of these heavy cast iron pots were also lost whilst transporting from ship to shore or vice versa.

As seen from the preliminary listing of ship casualties along the Namibian Coast, losses during the past 100 years increased because of the increase in European activities in the Southern African region. Due to improved communication, losses were also recorded and dealt with more thoroughly. An iconic shipwreck is the *Eduard Bohlen*, which was lost in 1909 at Conception Bay while trying to offload mining equipment for the newly opened diamond fields. As a manifestation of the constantly changing shoreline, the wreck lies today hundreds of meters inland from the beach, and is a touristic attraction on any scenic flight into the area.



The following wrecks occurred along the coast of the Central Namib Sand Sea:

Anne Mondell	1840s	Ichaboe Island
Atlantic Harvester	27/05/1967	Mercury Island
Balgowan Castle	08/1904	Easter Cliffs
Brandaris	05/08/1968	12 miles north of Conception Bay
Canute	03/1861	Ichaboe Island
Cawdor Castle	30/07/1926	south of Conception Bay
Consortium Omega	09/07/1981	Conception Bay
Daphne	23/11/1845	Ichaboe Island
Diaz	08/02/1926	Northcliff near Saddle Hill
Dolphin	18/01/1960	Conception Bay
Eliza	1840s	Ichaboe Island
Eagle	26/05/1861	south of Sandwich Harbour
Eduard Bohlen	05/09/1909	south of Conception Bay
Guernsey Lilly	1840s	Ichaboe Island
Heraclides	26/10/1907	Hottentot's Bay
Hondeklip	07/1928	Meob Bay

Hoevled 1	23/11/1968	north of Meob Bay
Hans die Skipper	08/05/1970	Conception Bay
Kent Bay	05/07/1850	Hottentot's
Lord Keane	1840s	Ichaboe Island
Limpopo	01/01/1930	Sylvia Hill
Orion	1840s	Ichaboe Island
Otavi	14/07/1945	Spencer Bay
Oceana Star	26/02/1975	Conception Bay
Princess Caroline	1755	Meob Bay
Solingen	04/11/1904	Hottentot's Bay
Shawnee	16/02/1976	north of Conception Bay
Tong Wa 107	17/04/1972	north of Spencer Bay
United Trader	16/12/1974	north of Spencer Bay
Valkyrie	18/10/1965	south of Meob Bay
Vlissingen	1748	Meob Bay



Destruction of old shipwrecks

Whalers along the Namibian Coast must be rated amongst the biggest culprits, because they destroyed many old shipwrecks. The scarcity of firewood left them with no alternative but to use ships planks and beams for fuel. Diamond prospectors also cleared the beaches for want of fire wood. Planks from a wreck at Meob were collected by diamond workers to build houses for protection against the harsh climate. It is also recorded that ship wreck planks were used to enforce the sides of the wells at Fischersbrunn to prevent the soft sand from the side filling up the wells.



South of Sandwich Harbour, the famous prospector Captain Louw once blasted part of an old wooden sail ship with dynamite to make provision for firewood for some workers at a prospecting camp. Besides some large copper nails and copper sheeting they did not find anything of value.

Workers of the company Industrial Diamonds of South Africa Ltd are said to have cleared the beaches north of Lüderitz after the World War II of all debris and old shipwreck planks to erect shelters and to use for firewood. The same happened at Conception Bay when the Namaqualand Diamond Mining Company operated there during the 1930's. Even smaller masts of the *Cawdor Castle* and *Eduard Bohlen* were chopped up for firewood. When workers were housed in the *Eduard Bohlen* they even broke down wooden panels in the ship and used them as fuel to prepare their

meals. Green (1933) writes that at night the port holes of the ship revealed the light of the burning fires and created the impression out at sea as if all lights were burning and the ship was sailing again.

Strandlopers also carried many usable artefacts along and discarded them whenever they no longer had any use for them. Pieces of broken bottles are evidence which were used either as a substitute for knives or scrapers. Some bottle necks were also found which were used as pipes. Copper nails found at fire places are an indication that ships' planks were used for cooking meals. Some of the Meob coins were found at a shell midden not far from Hottentot's Bay.

Spencer Bay

Whalers used to anchor in the bay during the whaling seasons for a period covering more than 100 years. It was known as "Death Beach" in earlier times, as the coast line was strewn with whalebone, vertebrae and bleached skeletons of Blue, Sei and Finn whales. Dolphin Head, the southern point of the Bay, rises almost sheer from the sea for 600 feet. Later, a German prospector erected a dwelling from recovered old ships planks near Spencer Bay. This he called "Hotel zur Trockenheit" (Hotel Drought) as fresh water was never found at Spencer Bay.

Saddle Hill

Shaped like a Mexican saddle, it is a fine landmark for navigators and a stop-over for any prospector who passed that way. There is a waterhole and a notice decorated with a skull and crossbones: Fill your water bottles. A very clear message from a prospecting pioneer of the past!

Hottentot's Bay



Here there are undoubtedly wrecks covered by moving dunes. According to oral records from around Gibeon, Strandlopers once witnessed how a ship called, how many heavy cases were transferred from the ship to the shore and buried, and how a couple of the people involved were shot and killed at the beach, whilst the rest returned to the ship and departed. The Strandlopers were afraid of ghosts and never visited that place where the white men had been digging (Green, 1933).

Ichabo Island

During February 1845 it was recorded that 451 ships were anchoring in the two-mile-wide channel between Ichabo Island and the mainland. Hundreds of sailors were clearing the guano deposits which Capt. Morrell had discovered on Monday 6 October 1828 when he visited Ichabo with his ship *Antarctic*. The guano sailors from Liverpool caused havoc on the Island with their mad carousals and bloodthirsty feuds. Two groups competed for



the guano, namely the agents of merchant houses and the private ship-owners and masters. Many graves on the Island and even more along the coast at Douglas Bay mark the last resting places of those unfortunate fortune seekers who lost their lives.

Many of the lost ships that came to load guano were driven ashore by the south-westerly gales. Fire wood for prospectors was available for many years. The island headman used to live in a chart house torn from the poop of a sailing ship, strengthened against the weather by timbers from other ships until the early 1930's. When the German ship *Solingen* stranded in November 1904 at Hottentot's Bay, Emilio, the Italian headman from Ichabo Island and some workers rowed over to replenish their supply of alcohol. During this unauthorised shopping expedition they discovered a piano in the dining saloon. On a subsequent excursion Emilio and some of his colleagues succeeded in hoisting the piano into their boat. It was a dangerous journey back but even more complicated to hoist the piano up the Ichabo jetty and transferring it into their dining hall. They eventually succeeded with many scratch marks, a few blue finger nails and one broken leg of the piano. Despite the damages, the piano provided the workers with many happy moments for many years.



Sylvia Hill

HMS *Sylvia* was built in 1866 in the Woolwich Dockyard. She was a surveying ship commissioned for foreign surveys. In 1880 she sailed from Cape Town, up the west coast to Walvis Bay and from there to St. Helena. During the survey this ship lent her name to this conspicuous double peaked hill which was surveyed by her Captain Aldrich for the first time (Kinahan, 1992).

Bibliography

- Axelson, E. 1973. *Congo to Cape. Early Portuguese Explorers*. Faber & Faber London. 224 pp.
- Baerike, M.E. 2007. *Lüderitzbucht*. Namibia Wissenschaftliche Gesellschaft, Windhoek, 189 pp.
- Bluck, B.J., Ward, J.D., Cartwright, J. and Swart, R. 2007. The Orange River, southern Africa: an extreme example of a wave-dominated sediment dispersal system in the South Atlantic Ocean. *J. geol. Soc. London*, **164**, 341-351.
- Brown, L.F.(Jr.), Benson, J.M., Brink, G.J., Doherty, S., Jollands, A., Jungslager, E.H.A., Keenan, J.H.G., Muntingh, A. and van Wyk, N.J.S. 1995. Orange Basin. In: Brown, L.F.Jr., *et al.* (Eds) *Sequence stratigraphy in offshore South African divergent basins*. AAPG Studies in Geology, **41**, 139-184.
- Corbett, I.B. 1989. *The sedimentology of diamondiferous deflation deposits within the Sperrgebiet*. Unpubl. Ph.D. thesis, Univ. Cape Town, 430 pp.
- Corbett, I. 1993. The modern and ancient pattern of sandflow through the southern Namib deflation basin, 45-60. In: Pye, K. and Lancaster, N. (Eds) *Aeolian sediments - ancient and modern*. Spec. Publ. Int. Assoc. Sedimentol., **16**, 167 pp.
- Dingle, R.V., Siesser, W.G. and Newton, A.R. 1983. *Mesozoic and Tertiary Geology of Southern Africa*. A.A. Balkema, Rotterdam, 375 pp.
- Green, L. 1933. *The Coast of Treasure*. Cape Town, Timmins.
- Hoffmann, K.-H., Constance, C. and Kohonen, J. 1994. Geological map 2314 – Kuiseb. *Geol. Surv. Namibia*, Windhoek.

- Jacob, R.J. 2005. *The erosional and Cenozoic depositional history of the lower Orange River, southwestern Africa*. Unpubl. PhD thesis, Univ. Glasgow, Vol. 1 – text, 167 pp, Vol. 2 – figures and appendices, 187pp.
- Jacob, R.J., Bluck, B.J. and Ward, J.D. 1999. Tertiary-age diamondiferous fluvial deposits of the lower Orange River valley, southwestern Africa. *Econ. Geol.*, **94**, 749-758.
- Kinahan, J. 1992. By Command of their Lordships. The exploration of the Namibian Coast by the Royal Navy, 1795-1895. ISBN 99916-707-0-X, 216 pages.
- Kinahan, J. 2001. *Pastoral Nomads of the Namib Desert*. Namibia Archaeological Trust, Windhoek, 167 pp.
- Kohl, H. and Schoeman, A. 2004. *Kolmanskop – Past and Present*. Klaus Hess Publishers, Windhoek/Göttingen.
- Lancaster, N. 1989. *The Namib Sand Sea: Dune forms, processes and sediments*. AA Balkema, Rotterdam.
- Louw, G.N. and Seely, M.K. 1982. *Ecology of Desert Organisms*. Longman, London, 194 pp.
- Miller, R. McG. 2008. *The Geology of Namibia. Vols. 1 -3*, Geological Survey of Namibia.
- Miller, R. McG., Sawyer, E.W., Hill, R.S., and Engelbrecht, L.N.J. 1975. Geological map of the Conception Bay – Meob Bay area, 2414. *Geol. Surv. Namibia*, scale 1:250 000.
- Mourer-Chauviré, C., Senut, B., Pickford, M. and Mein, P. 1996a. Le plus ancien représentant du genre *Struthio* (Aves, Struthionidae), *Struthio coppensi* n. sp. Du Miocène inférieur du Namibie. *Comptes Rendus de l'Académie des Sciences, Paris*, **322**, 325-332.
- Mourer-Chauviré, C., Senut, B., Pickford, M., Mein, P. and Dauphin, Y. 1996b. Ostrich eggs, legs and phylogenies. *S. Afr. J. Sci.*, **92**, 491-495.
- Muntingh, A. 1993. Geology, prospects in Orange basin offshore western South Africa. *Oil Gas J.*, **Jan 26**, 106-109.
- Muntingh, A. and Brown, L.F.(Jr.) 1993. Sequence stratigraphy of petroleum plays, post-rift Cretaceous rocks (Lower Aptian to Upper Maastrichtian), Orange Basin, western offshore, South Africa, 71-98. In: Weimer, P. and Posamentier, H. (Eds) *Siliciclastic sequence stratigraphy: recent developments and applications*. Mem. Amer. Assoc. Petrol. Geol., **58**, 492 pp.
- Pickford, M., 2000. Fossil spider's webs from the Namib Desert and the antiquity of *Seothyra* (Araneae, Eresidae). *Annales de Paléontologie*, **86**: 147-155.
- Pickford, M., 2008. Arthropod bioconstructions from the Miocene of Namibia and their palaeoclimatic implications. *Mem. geol. Surv. Namibia*, **20**: 53-64.
- Pickford, M., 2009. New Ratite Eggshells from the Miocene of Namibia. *Communs geol. Surv. Namibia*, **14** : 55-71.
- Pickford, M. and Senut, B. 1999. Geology and palaeobiology of the Namib Desert. *Mem. geol. Surv. Namibia*, **18**, 155 pp.
- Pickford, M.F.H., Senut, B. and Dauphin, Y. 1995. Biostratigraphy of the Tsondab sandstone (Namibia) based on gigantic avian eggshells. *Geobios.*, **28**, 85-98
- Rogers, J. 1977. Sedimentation on the continental margin off the Orange River and the Namib Desert. *Bull. mar. Geosci. Grp., geol. Surv. S. Afr. & Univ. Cape Town*, **7**, 162 pp.
- Schneider, G.I.C. 2009. *Treasures of the Diamond Coast*. MacMillan Education Namibia, Windhoek, 320 pp.
- Schneider, G.I.C. and Marais, C. 2004. *Passage through Time. The fossils of Namibia*. Gamsberg Macmillan, Windhoek, Namibia, 158 pp.
- Ségalen, L., Renard, M., Pickford, M., Senut, B., Cojan, I., Le Callonec, L. and Rognon, P. 2002. Environmental and climatic evolution of the Namib Desert since the Middle Miocene: the contribution of carbon isotope ratios in ratite eggshells. *Comptes Rendus Geoscience*, **334**: 917-924.
- Senut, B. and Pickford, M., 1995. Fossil eggs and Cenozoic continental biostratigraphy of Namibia. *Palaeontologica africana*, **32**: 33-37.

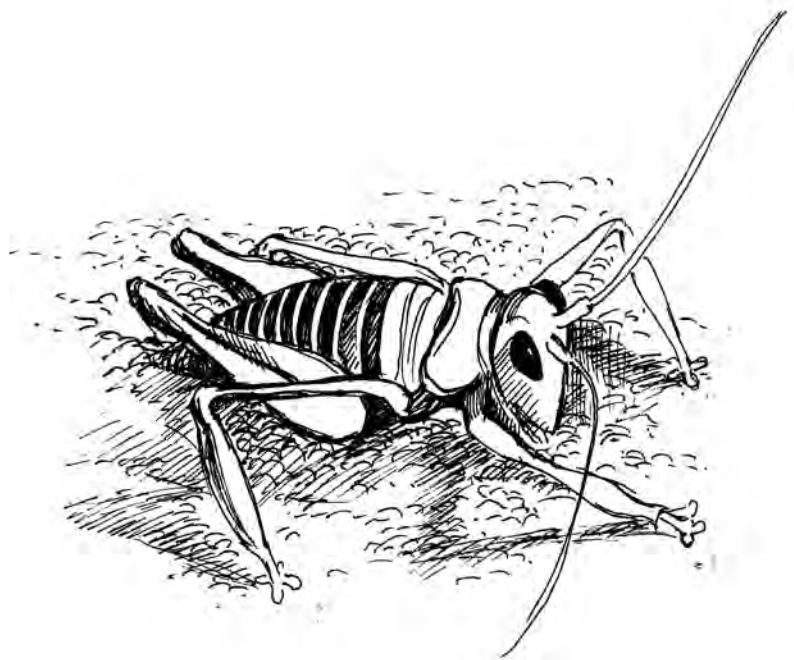
- Senut, B., Pickford, M. and Dauphin, Y., 1995. Découverte d'oeufs de type « aepyornithoïde » dans le Miocène inférieur de Namibie. *Comptes Rendus de l'Académie des Sciences, Paris*, **320**: 71-76.
- Senut, B., Pickford, M. and Ségalen, L., 2009. Neogene desertification of Africa. *Comptes Rendus Geoscience*, **341**: 591-602.
- Siesser, W.G. and Salmon, D. 1979. Eocene marine sediments in the Sperrgebiet, South West Africa. *Ann. S. Afr. Mus.*, **79**, 9-34.
- Stocken, C.G. 1962. The diamond deposits of the Sperrgebiet, South West Africa. *Excursion Guide, 5th Congr., geol. Soc. S. Afr.*, 15 pp.
- Ward, J.D. 1987. The Cenozoic succession in the Kuiseb Valley, central Namib Desert. *Mem. geol. Surv. Namibia*, **9**, 124 pp.
- Ward, J.D. 1988. Eolian, fluvial and pan (playa) facies of the Tertiary Tsondab Sandstone Formation of the central Namib Desert, Namibia. *Sediment. Geol.*, **55**, 143-162.
- Ward, J.D., Seely, M.K. and Lancaster, N. 1983. On the antiquity of the Namib. *S. Afr. J. Sci.*, **79**, 175-183.

Further reading

- Africa Pilot. 1977. Admiralty Sailing Directions, Africa Pilot Volume II. Twelfth Edition. 248 pp.
- Besler, H. 1980. Die Dünen-Namib: Entstehung und Dynamik eines Ergs. *Stuttg. geogr. Stud.*, **96**, 208 pp.
- Green, J. 1990 *Maritime Archaeology. A Technical Handbook*. Academic Press Limited, London, 282 pp.
- Kinahan, J. 1988. *The Pillar in the Mist: a History of the Dias Padrao at Lüderitz*. National Monuments Council, Windhoek, 509 pp.
- Kinahan, J. 1991. The historical archaeology of nineteenth century fisheries at Sandwich Harbour on the Namib Coast. *Cimbebasia*, **13**, 1-27.
- Kinahan, J. 1991. *Pastoral Nomads of the Central Namib Desert. The people history forgot*. New Namibia Books, Windhoek, 167pp.
- Rudner, J. 1981. The legal protection of historical shipwrecks in South Africa. *Bull S. Afr. Museums Assoc.*, **14**, 317-320.
- Senut, B. 2000. Fossil ratite eggshells: a useful tool for Cainozoic stratigraphy in Namibia. *Communs geol. Surv. Namibia*, **12**, 367-373.
- Senut, B. and Pickford, M.F.H. 1995. Fossil eggs and Cenozoic continental biostratigraphy of Namibia. *Palaeontol. Afr.*, **32**, 33-37.
- Ward, J.D. 1984. *Aspects of the Cenozoic Geology in the Kuiseb Valley, central Namib Desert*. Unpubl. Ph.D. thesis, Univ. Natal, 310 pp.
- Senut, B., Dauphin, Y. and Pickford, M., 1998. Nouveaux restes aviens du Néogène de la Sperrgebiet (Namibie): Complément à la biostratigraphie avienne des éolianites du désert de Namib. *Comptes Rendus de l'Académie des Sciences, Paris*, **327**, 639-644.
- Starbuck, A. 1989. *History of the American whale fishery*. Castle Books, 779 pp.
- Potgieter, C. 1969. *Skipbreuke aan ons kus*. Nasionale Handelsdrukkery, Cape Town, 220 pp.

Annex 5

Ecology & Evolutionary Processes



At the time of printing, the contribution to the Namib Sand Sea World Heritage Nomination dossier on 'Ecology and Evolutionary Processes' was not available due to technical problems. This report will be submitted as a late submission to the Annexes shortly.

Annex 6

Overview of Vegetation



Flora of the Namib Sand Sea

by Herta Kolberg, boscia@mweb.com.na

Five flowering plant species are endemic to the sand sea. They are *Hermannia minimifolia* Friedr.-Holzh. (Sterculiaceae), *Stipagrostis seelyae* De Winter, *Stipagrostis pellytronis* De Winter (Poaceae), *Sesamum abbreviatum* Merxm. (Pedaliaceae) and *Monsonia ignorata* Merxm. & A.Schreib. (Geraniaceae). A few other species also occur here as well as into sandy habitats further north e.g. *Trianthea hereroensis* Schinz. Others have disjunct distributions on other sandy habitats, e.g. some legumes, nara (*Acanthosicyos horridus* Welw. ex Hook. f.) and *Hexacyrtis dickiana* Dinter.

The sand sea area has been identified as one of the Namibian floristic groups (Craven 2009). The floristic area is delineated by the ranges of a small, but unique group of endemic species. It stretches from the sand dunes south of the Kuiseb River to the Koichab River (at about the latitude of Lüderitz), and includes Sossusvlei. The area is 100 to 150 km broad and has a maximum elevation of 900 m. The eastern border is a narrow section of Namib plains leading up to the southern escarpment. Features of the area that affect the plants are the linear dunes that run roughly south to north and dominate the inland areas, the very high reflectivity of the soil, and limited rain recorded as being during summer. The area is homogenous and there is therefore no subdivision of species composition.

The diversity of plant species is limited, but the populations may be large in good seasons. Only highly adapted species are able to persist in this environment as perennials, either herbaceous or as dwarf shrubs. Especially on the Namib plains within the sand sea, ephemeral annual plants and bulbs can appear in huge numbers after good rainfall. Only in exceptional years will there be new plant growth on the sand dunes themselves, as witnessed at Sossusvlei in 2006. The most representative family is the Poaceae (grasses) and single species of the Aizoaceae, Geraniaceae and Pedaliaceae also occur. While most floristic groups show relationships with other areas of the world, these narrow endemics do not. Only some species that are found in the south of the area can be found in the Northern Cape Province of South Africa.

The area identified floristically excludes a very narrow coastal strip because this is occupied by species from the Southern Namib Succulent Desert (Craven 2009). Similarly some of the species found on the few isolated mountains and hills that occur in the main Namib sand sea, for example the Hauchab and Uri-Hauchab, are associated with Highland Group further east in Namibia (Craven 2009), where the altitude increases and more habitats are available to the plants. This differs from Burke *et al.* (1998) in that endemics for that ecosystem were differentiated from the others found there because of other habitats within the sand sea. The Tsauchab and Tsondab Rivers extend a part of the Namib plains westwards into the sand sea. These rivers and the Tsaris River disappear under the sand and never reach the sea. A number of plant species are associated with these water courses, but are not limited to the sand sea.

Reasons why plants occur where they do and clues to their origins are sought by assessing all available phylogenies, palaeoclimate data and vegetation analyses. There is very little evidence for this area in the fragmentary fossil record for Namibia and no molecular studies have been carried out on the species here. This group of plants occurs between a floristic group in the north of considerable age with molecular evidence showing links to arid NE Africa, and a young floristic group in the south consisting mainly of succulent plants that also occur down to the

Orange River and marginally into the Northern Cape. Two of the families represented on the sea of sand also have the most endemic taxa in other sandy areas, like the Kalahari, but they are represented by different taxa that must have evolved separately to become adapted to the lower solar radiation levels, cloudiness, humidity, wind and lower altitudes. The importance of an area cannot be defined by numbers, but rather in the uniqueness of the taxa as explained above.

The actual number of species that occur in the Namib Sand Sea is not easy to calculate because most are associated with other habitat types like rocky outcrops, washes etc. within the sand sea and this is not always clearly indicated on the data available. A simple search on plant distributions will therefore not give the desired result. The Namib Sand Sea is also an under collected area from a botanical point of view. The few collections that have been made generally come from the rocky outcrops. Also because of the highly variable rainfall, many species may have been missed by collectors because they were not at the right place at the right time. In the past, plant collections were mapped (and databased) on a quarter-degree grid system. This is too coarse a system to distinguish between species that really occur on sand and those that occur in the small pockets of other habitats (washes, rocky outcrops) within the sand sea. The available data therefore are insufficient to provide a list of species from which other statistics could be derived (Kolberg & Craven, ongoing).

Burke, A., Jürgens, N. and Seely, M.K. 1998. Floristic affinities of an inselberg archipelago in the southern Namib desert - relic of the past, centre of endemism or nothing special? *Journal of Biogeography* 25:311–317.

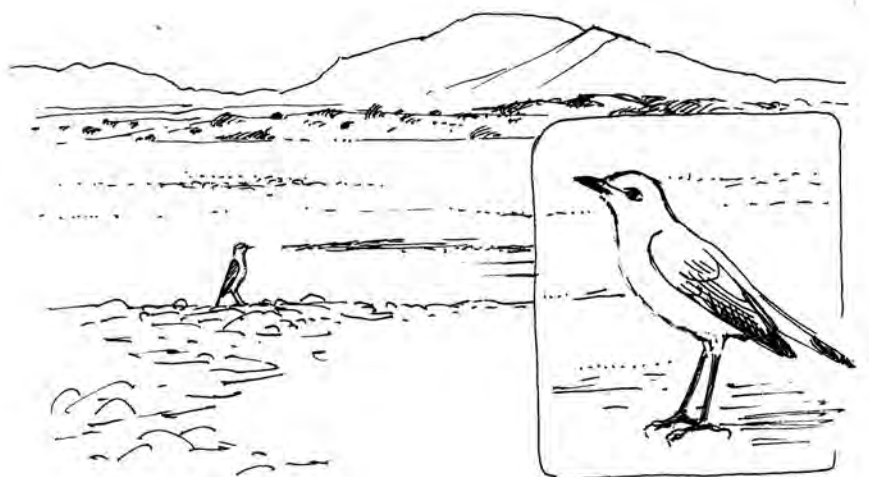
Craven, P. 2009. Phytogeographic study of the Kaokoveld Centre of Endemism. Unpublished PhD, University of Stellenbosch

<http://scholar.sun.ac.za/bitstream/handle/10019.1/1325/Craven,%20P.pdf?sequence=1>

Kolberg, H. & Craven, P. Ongoing. Computerised Herbarium of Plants in Namibia (CHOPIN).

Annex 7

Overview of Birds



Overview of Birds of the Namib Sand Sea

Peter Bridgeford and Mary Seely

The Namib Sand Sea taken in its entirety has been recorded to harbour approximately 300 species of birds - at least occasionally. The overwhelming majority of these birds are found on the edges of the Namib Sand Sea, on rocky outcrops and surrounding plains, along the coast and at Sandwich Harbour, as well as in the dunes. They are common along the Kuiseb River on the northern boundary and the other large ephemeral rivers such as the Tsondab and Tsauchab. The vast majority of these birds only enter the Namib Sand Sea occasionally and don't go very far into the dune interior, if at all.

Endemic species: The only endemic species in the Namib Sand Sea is the Dune Lark, *Calendulauda erythrochlamys*. It inhabits the dune sea wherever the perennials, *Trianthema hererosensis* and *Stipagrostis sabulicola*, provide suitable habitat and other resources. This bird has developed a set of special feeding habits using the insects and seeds offered by different parts of a dune slope over the course of a day and year. Yet another unusual aspect of the Dune Lark is its longevity; one female was recaptured over a ten-year period. This is apparently an important adaptation for spanning the frequent years of little or no rain. The *near Namib endemic*, Rüppell's Korhaan *Eupodotis ruepellii*, uses the ephemeral rivers and plains to penetrate far into the Sand Sea.

On the plains immediately north of the Namib Sand Sea within the delineated buffer zone of the Property, an arid-adapted, localised Namib endemic species, Grey's Lark, *Ammomanes grayi*, represents the second locally endemic species although not found in the Namib Sand Sea itself.

Nesting in the Namib Sand Sea: Three resident bird species are known to nest directly on the sand in the central dunes, although apparently rarely, and others may do so undetected to date. The known examples include the Ostrich, *Struthio camelus*, the Spotted Eagle Owl, *Bubo africanus* and Namaqua Sandgrouse *Pterocles namaqua*. A variety of raptors hunting in the vegetated dunes use !nara bushes growing on dune slopes for nesting. These common raptors include Greater Kestrels *Falco rupicoloides*, Rock Kestrels *Falco rupicolus* and Black-chested Snake-Eagles *Circaetus pectoralis*. They have also been recorded from the rocky coast at places like Sylvia Hill, the flats at Meob and Sandwich Harbour. The huge, *Endangered* Martial Eagle *Polemaetus bellicosus*, breeds in the Tsauchab and Tsondab Rivers and scattered trees found on the plains, far into the sand sea. Even Secretary Birds *Sagittarius serpentarius*, have been found nesting in trees on the dunes and feeding in the sand sea.

The Namib Sand Sea is an important breeding area for the largest carrion eater in Africa, the Lappet-faced Vulture *Aegypius tracheliotos*. They use camel thorn and other trees in the ephemeral rivers and scattered trees on the plains. However, they also breed in trees in the dunes.

In addition, a multiplicity of species, primarily inhabiting the coastal dunes and flats, rocky outcrops and Sandwich harbour, are considered as breeding

residents. One of these is the near-endemic Damara Tern *Sterna balaenarum*, breeding on the flats along the coast and between the dunes. North and south of the Sand Sea, mining and off-road driving has led to the loss of some breeding colonies of this *Near Threatened* species.

Feeding in the Namib Sand Sea: The Namib Sand Sea supports several raptors with their base in the bordering ephemeral rivers where camel thorn trees *Acacia erioloba* grow. Most common is the Pale Chanting Goshawk, *Melierax canorus*, a regular daytime predator on the nearby dunes. The Spotted Eagle Owl, *Bubo africanus*, and Barn Owl *Tyto alba* prey on birds, invertebrates and small mammals such as the golden mole and gerbils at night. Similarly, the Pied Crow, *Corvus albus*, and Black Crow, *Corvus capensis*, can be found chasing lizards and tenebrionid beetles throughout the sand sea. Although not breeding in the sand sea, White-backed Vultures *Gyps africanus* feed in this area.

A number of smaller bird species not resident in the Namib Sand Sea frequently enter the edges of the sand sea throughout the year to prey upon appropriate food items. These include the Rock Martin, *Hirundo fuligula*, Bradfield's Swift, *Apus bradfieldi* and migrant Barn Swallows *Hirundo rustica*, that soar along the dune slipfaces capturing flying insects attracted to this specialised habitat. Occasionally a Familiar Chat, *Cercomela familiaris*, will sit on the crest of the slipface surveying available insects. They are widespread in the sand sea and breed along the coast in long-abandoned mine buildings.

Other more mobile bird species occupy the Namib Sand Sea for extended periods particularly after good rains. The Greybacked Sparrowlark, *Eremopterix verticalis*, suddenly arrives in large flocks in the interdune valleys, where the annual grass *Stipagrostis gonatostachys* grows rapidly while profusely distributing its seeds, and then disappears just as suddenly. On a different scale, Ludwig's Bustard, *Neotis ludwiggii*, stalks the interdune and dune slopes consuming tenebrionid beetles as long as they remain abundant and easily picked off the surface. The Ludwig's Bustards are usually found in family groups of three or four birds together, but nests have not been located in the Namib Sand Sea.

In conclusion: Of the overall total, approximately 86 species are associated with water and primarily found at the Sandwich Harbour Ramsar Site on the north-western corner of the identified property. Other sites along the coast or temporary inland ponds or artificial dams can host a number of species. One of these, Sossus Vlei, attracts several species of water birds when the vlei is flooded even though this is an infrequent occurrence. Moreover, the Namib Sand Sea protects the only two mainland breeding colonies of African Penguins *Spheniscus demersus* in Namibia. Classed as *Vulnerable*, the small colony of African Penguins at Sylvania Hill and another 20 km further south at Easter Point are important sites for these Southern African breeding endemics.

Another 72 species have been recorded on the northern boundary of the Namib Sand Sea at the Gobabeb Training and Research Centre. These represent a mixture of the single Namib Sand Sea endemic, numerous

species dependent on the Kuiseb riverine forest entering the sand sea only occasionally and some that are mainly found in the bordering plains in the buffer area but infrequently appear over the Namib Sand Sea.

The special birds of the Namib Sand Sea are mainly located at the Sandwich Harbour Ramsar Site on the north-western corner of the identified property and along the coast. The one true dune endemic inhabits the dune sea wherever the perennial *Trianthema hererosensis* and *Stipagrostis sabulicola* provide suitable habitat and other resources. Nevertheless, a number of birds resident on the borders of the Namib Sand Sea have the potential to give up their secrets concerning interactions with the dune environment upon closer and longer term observation.

Annex 8

Overview of Mammals



Overview of Mammals of the Namib Sand Sea

By Stephanie Fennessy

The Namib Sand Sea provides critical habitat for 57 different mammal species, including two, which are endemic to the area; namely the Grant's golden mole (*Eremitalpa granti namibensis*) and the Dune hairy-footed gerbil (*Gerbillurus tytonis*).

The majority of mammals in the Namib Sand Sea are not permanent residents, but migratory species, occasionally utilising this habitat or seasonally expanding their range. As an example, there is a regular east-west migration of antelopes such as gemsbok (*Oryx gazella*) and spingbok (*Antidorcas marsupialis*) across the nominated property, which is dependent on seasonal and spatial rainfall distribution. These antelope also seek the solitude and safety of the Namib-Naukluft National Park for calving and the period following. These migration patterns have most likely been occurring for a millennium or more, and are integral to the ranging behaviour of these and other mammals of the Namib Sand Sea.

Mammals vary in their use the different habitat types existing within the nominated property. Whilst very few (but a few important) mammals utilise the dune slopes, gravel plains, ephemeral riverbeds, rocky outcrops and inselbergs offer more attractive habitat primarily for forage and shelter. As examples, Rock hyrax (*Procavia capensis*) and Dassie rats (*Petromus typicus*) primarily use rocky outcrops and inselbergs, and gemsbok and springbok primarily use gravel plains and ephemeral riverbeds, while Grant's golden moles and Dune hairy-footed gerbils appear to be the only mammals who permanently reside in the dune fields.

Grant's golden mole and Dune hairy-footed gerbils are also the only two endemic mammals, whose range are totally restricted to the Namib Sand Sea. Other gerbil species frequent this habitat but are not confined to it. The golden mole is a small, blind, subterranean insectivore with a silky greyish-yellow coat with a silvery sheen. The claws on the front feet are broad and hollowed out and serve as modified shovels for digging through loose sand. Unlike other subterranean animals, the Grant's golden mole lacks an underground burrow system, but 'swims' through the sand and emerges onto the surface to forage for its prey. Its prey comprises largely of invertebrates such as termites and insect larvae, as well as crickets, moths, spiders and legless lizards. However, it will eat anything it can catch and overpower, with the web-footed gecko recorded as its largest prey species. The golden mole is solitary and moves randomly within their home range. Food sources are not only sparse in the Namib Sand Sea, but also patchily distributed, so moles must forage across considerable distances (up to 600m per night) in search of adequate prey. As the energy cost of sand-swimming is far lower than burrowing through solid ground (yet 80 times higher than that of running on the surface), it is unlikely that the Grant's golden moles could exist in areas with such low abundance of food, if the substrate were more compacted. When not active, the moles shelter beneath vegetation hummocks where they are afforded some protection from predators such as black-backed jackals (*Canis mesomelas*) and owls. They are physiologically unique in their

ability to abandon thermoregulation during their daily rest, allowing their body temperature to drop to ambient and depressing their metabolic rate, thus allowing slow breathing and lower rates of water loss. This makes the Grant's golden mole the only known 'reptile-like-mammal' and a unique mammal on the nominated property.

Historically, the nominated property and the buffer zone were abundant with wildlife. Black rhino used to roam the ephemeral riverbed of the Tsondab River, as did giraffe, lion, hartebeest and wild dog. However, all these large mammals are now locally extinct but many exist along its eastern border.

The harsh environment of the Namib Sand Sea poses an extreme challenge to carnivores. However, three large carnivores are acutely adapted to life in the desert: spotted hyaena (*Crocuta crocuta*), brown hyaena (*Parahyaena brunnea*) and black-backed jackal. While spotted hyaena mainly occur throughout the eastern parts of the nominated property, the other two carnivores make intensive use of the coastal area and are more abundant. All three species show adaptations towards living in such a harsh desert environment, including variations in home range, social interaction patterns, preferred forage sources and adapted diurnal/nocturnal activity peaks.

South African fur seals (*Arctocephalus pusillus*) are common along the Southern African west coast from South Africa to Angola. Large colonies are formed on the rocky promontory at Sylvia Hill and on sandy beaches at Meob and Conception Bays, and Ilheo Point, the spit of land protecting the lagoon at Sandwich Harbour. The seals pup in late November or early December, and become easy but valuable prey for brown hyaena and black-backed jackals.

Gemsbok are arguably the best adapted animal of the desert. Found in a wide range of arid habitats, it is the most common large mammal in the Namib Sand Sea. Gemsbok mainly feed on grass, but also browse and dig up tubers, roots and bulbs if necessary and find water by devouring melons and !Nara, which contain high water contents. Interestingly, gemsbok can concentrate their urine and absorb all possible moisture from faeces, to prevent unnecessary water loss. However, their most important adaptation to desert life, is their ability to allow their body temperature to rise to 40°C before beginning evaporative cooling by panting and sweating. While increasing their body temperature, the brain temperature is kept at lower levels. A sophisticated network of blood vessels beneath the brain, together with rapid panting helps to cool the blood in the nasal sinuses and allow for heat exchange between arteries and veins. As a result, blood from the heart to the brain is several degrees cooler than the rest of the body facilitating survival in this harsh arid environment.

The extensive gravel plains around Conception Bay and several inselbergs isolated within the Namib Sand Sea are home to some phylogenetic and ecological relict species, now limited to these areas with no viability to migrate elsewhere. For example, there used to be a population of springbok at Conception Bay who

probably moved there many years earlier when the Tsauchab River occasionally managed to break through to the ocean. These springbok have recently been shot and are unlikely to ever be replaced due to the restrictive nature of future immigration into this area.

From a conservation status perspective, two species in the Namib Sand Sea are listed as 'Vulnerable' on the IUCN Red List, namely Grant's golden mole and cheetah (*Acinonyx jubatus*). While cheetah predominantly utilise the nominated property at the extreme range of their habitat, the Grant's golden mole is endemic and restricted to the nominated property. Additionally, cheetah's conservation status is based on the low number of remaining animals in the wild, Grant's golden mole's status is based on its extent of occurrence and area of occupancy, both these factors directly relating to the habitat offered by the nominated property and stressing the mammals dependence on this area. One other mammal species occurring in the Namib Sand Sea is classified as Near Threatened, the Angolan hairy bat (*Cistugo seabrai*).

Sources:

- Boyer, D. C. 1987. **Effect of Rodents on Plant Recruitment and Production in the Dune Area of the Namib Desert**. MSc Thesis. University of Natal.
- Bridgeford, P. & M. 2009. **Touring Sesriem & Sossuvlei**. P. & M. Bridgeford. Namibia.
- Seely, M. & Pallett, J. 2008. **Namib – Secrets of a desert uncovered**. Venture Publications. Namibia.
- Seely, M. 2010. **The Namib – Natural History of an Ancient Desert**. Desert Research Foundation of Namibia. Namibia.
- Skinner, J. D. & Chimimba, C. T. 2005. **The Mammals of the Southern African Subregion**. Third Edition. Cambridge University Press.

Annex 9

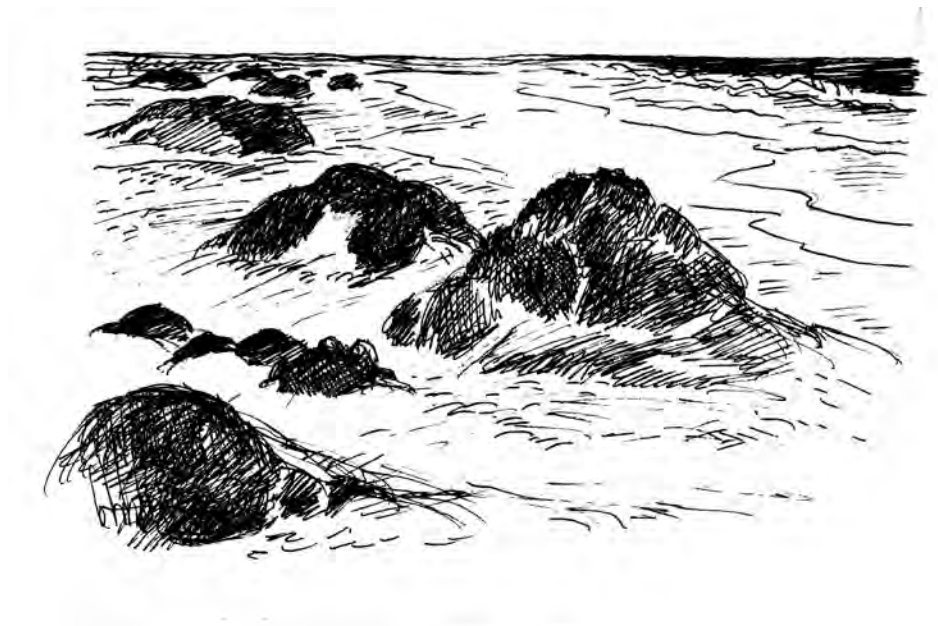
Table of Aliens



Family	Genus	Species	Common Name	Occurrence within Namib Sand Sea
Euphorbiaceae	<i>Ricinus</i>	<i>communis</i>	Castor Bean	Epemeral rivers
Fabaceae	<i>Prosopis</i>	<i>glandulosa</i>	Prosopis tree	Ephemeral rivers, mostly eradicated
Solanaceae	<i>Datura</i>	<i>ferox</i>	Thorn-apple	Epemeral rivers
Solanaceae	<i>Datura</i>	<i>innoxia</i>	Thorn-apple	Epemeral rivers
Solanaceae	<i>Datura</i>	<i>metel</i>	Thorn-apple	Epemeral rivers
Solanaceae	<i>Datura</i>	<i>stramonium</i>	Thorn-apple	Epemeral rivers
Solanaceae	<i>Nicotiana</i>	<i>glauca</i>	Wild tobacco	Epemeral rivers
Cyprinidae	<i>Cyprinus</i>	<i>carpio</i>	Common Carp	Rare Vagrant after floods
Columbidae	<i>Columba</i>	<i>livia</i>	Feral Pigeon	Human settlements (also abandoned)
Ploceidae	<i>Passer</i>	<i>domesticus</i>	House Sparrow	Human settlements (also abandoned)
Muridae	<i>Mus</i>	<i>musculus</i>	House Mouse	Human settlements (also abandoned)
Muridae	<i>Rattus</i>	<i>rattus</i>	Common House Rat	Eradicated
Pholcidae	<i>Pholcus</i>	<i>phalangioides</i>	Long-legged Spider	Human settlements (also abandoned)
Pholcidae	<i>Smeringopus</i>	<i>pallidus</i>	Long-legged Spider	Human settlements (also abandoned)
Theridiidae	<i>Latrodectus</i>	<i>geometricus</i>	Black-widow Spider	Sandwich Harbour and human settlements
Uloboridae	<i>Uloborus</i>	<i>plumipes</i>	Spider	Sandwich Harbour
Lepismatidae	<i>Ctenolepisma</i>	<i>longicaudata</i>	Silverfish	Human settlements (also abandoned)
Blatellidae	<i>Blatella</i>	<i>germanica</i>	Kitchen cockroach	Human settlements (also abandoned)
Cerambycidae	<i>Arhopalus</i>	<i>ferus</i>	Longhorn Beetle	Beach driftwood
Ptinidae	<i>Stethomezium</i>	<i>squamosum</i>	Ptinid Beetle	Coastal area
Gryllidae	<i>Acheta</i>	<i>domestica</i>	Cricket	Human settlements (also abandoned)
Gryllidae	<i>Gryllus</i>	<i>bimaculatus</i>	Cricket	Human settlements (also abandoned)
Pthiridae	<i>Pthirus</i>	<i>pubis</i>	Pubic Lice	Human ectoparasite
Pulicidae	<i>Pulex</i>	<i>irritans</i>	Common Flea	Human settlements (also abandoned)

Annex 10

Table of Vegetation



Namib Sand Sea Biogeography Biogeography description

- a. Sand Sea Sand Sea inhabitants rarely ranging outside dune habitats
- b. Inselbergs Petrophilous inselberg inhabitants occurring as isolated populations within the Sand Sea
- c. Widespread May inhabit any part of the property due to vagility and catholic ecological choice
- d. Boundinging Mostly found adjacent to the Sand Sea and contributing to biodiversity and ecology through suitable habitat inside the property, marginally intruding or absent from dunes
- e. Sandwich Ramsar Specific Sandwich Harbour Ramsar site inhabitants

Ecological range

- i. Dune Sea specialist
- ii. Arid area specialist
- iii. Habitat specialist
- iv. Generalist

Ecological range description

- Psammophilous species restricted to Namib Biome sand dunes
- Euryaceous species restricted to arid biome habitats
- Stenotypic species, habitat, host or prey specific
- Not habitat specific with wide ecological choice

Status

- 01. Strict Endemic
- 02. Dune Endemic
- 03. Near Endemic
- 04. Common Resident
- 05. Rare Resident
- 06. Relict
- 07. Interdigitated resident
- 08. Marginal presence
- 09. Common migrant
- 10. Intermittent visitor
- 11. Vagrant
- 12. Alien
- 13. Domesticated

Status Description

- Psammophilous species only found in Namib Sand Sea
- Psammophilous species in Namib Sand Sea, range extend to outer Namib Biome dune areas
- Restricted to Namib Biomes
- Common throughout Namib Sand Sea property
- Rarely recorded from Namib Sand Sea property, not unexpected
- Isolated healthy populations in Namib Sand Sea far from core species range
- Readily found inside the property at suitable habitat intruding into the Sand Sea
- Incidental presence within the property from range overspill
- Present whenever conditions are suitable
- Rarely occur only when conditions are suitable
- Unusual and isolated records
- Feral populations of extralimital species
- Introduced alien species that is managed, occasionally vagrant

Order	Family	Genus	Species	NSS Biogeography	NSS Ecological range	NSS Status
Kingdom: Plantae	Phylum: Angiospermophyta	Class: Angiospermae				
Asparagales	Hyacinthaceae	<i>Dipcadi</i>	<i>bakeranum</i>	d. Bounding	iv. Generalist	04. Common Resident
Asparagales	Hyacinthaceae	<i>Ornithogalum</i>	<i>candidum</i>	d. Bounding	iv. Generalist	04. Common Resident
Asparagales	Hyacinthaceae	<i>Ornithogalum</i>	<i>stapffii</i>	d. Bounding	iv. Generalist	04. Common Resident
Kingdom: Plantae	Phylum: Angiospermophyta	Class: Magnoliatae				
Apocynales	Apocynaceae	<i>Ectadium</i>	<i>latifolium</i>	d. Bounding	iv. Generalist	04. Common Resident
Apocynales	Apocynaceae	<i>Ectadium</i>	<i>virgatum</i>	d. Bounding	iv. Generalist	04. Common Resident
Apocynales	Apocynaceae	<i>Gomphocarpus</i>	<i>filiformis</i>	d. Bounding	iv. Generalist	04. Common Resident
Apocynales	Apocynaceae	<i>Hoodia</i>	<i>gordonii</i>	d. Bounding	iv. Generalist	04. Common Resident
Apocynales	Apocynaceae	<i>Hoodia</i>	<i>pedicellata</i>	d. Bounding	iv. Generalist	04. Common Resident
Apocynales	Apocynaceae	<i>Larryleachia</i>	<i>marlothii</i>	d. Bounding	iv. Generalist	04. Common Resident
Apocynales	Apocynaceae	<i>Nerium</i>	<i>oleander</i>	d. Bounding	iv. Generalist	04. Common Resident
Apocynales	Apocynaceae	<i>Orthanthera</i>	<i>albida</i>	d. Bounding	iv. Generalist	04. Common Resident
Apocynales	Apocynaceae	<i>Pergularia</i>	<i>daemia</i>	d. Bounding	iv. Generalist	04. Common Resident
Asterales	Asteraceae	<i>Laggera</i>	<i>decurrens</i>	d. Bounding	iv. Generalist	04. Common Resident
Asterales	Asteraceae	<i>Chrysanthemoides</i>	<i>incana</i>	d. Bounding	iv. Generalist	04. Common Resident
Asterales	Asteraceae	<i>Engleria</i>	<i>africana</i>	d. Bounding	iv. Generalist	04. Common Resident
Asterales	Asteraceae	<i>Epaltes</i>	<i>gariepina</i>	d. Bounding	iv. Generalist	04. Common Resident
Asterales	Asteraceae	<i>Eriocephalus</i>	<i>pinnatus</i>	d. Bounding	iv. Generalist	04. Common Resident
Asterales	Asteraceae	<i>Gazania</i>	<i>jurineifolia</i>	d. Bounding	iv. Generalist	04. Common Resident
Asterales	Asteraceae	<i>Geigeria</i>	<i>alata</i>	d. Bounding	iv. Generalist	04. Common Resident
Asterales	Asteraceae	<i>Geigeria</i>	<i>ornativa</i>	d. Bounding	iv. Generalist	04. Common Resident
Asterales	Asteraceae	<i>Helichrysum</i>	<i>obtusum</i>	d. Bounding	iv. Generalist	04. Common Resident
Asterales	Asteraceae	<i>Helichrysum</i>	<i>roseo-niveum</i>	d. Bounding	iv. Generalist	04. Common Resident
Asterales	Asteraceae	<i>Hirpicium</i>	<i>gazanioides</i>	d. Bounding	iv. Generalist	04. Common Resident
Asterales	Asteraceae	<i>Kleinia</i>	<i>longiflora</i>	d. Bounding	iv. Generalist	04. Common Resident
Asterales	Asteraceae	<i>Nidorella</i>	<i>resedifolia</i>	d. Bounding	iv. Generalist	04. Common Resident
Asterales	Asteraceae	<i>Osteospermum</i>	<i>microcarpum</i>	d. Bounding	iv. Generalist	04. Common Resident
Asterales	Asteraceae	<i>Osteospermum</i>	<i>muricatum</i>	d. Bounding	iv. Generalist	04. Common Resident
Asterales	Asteraceae	<i>Othonna</i>	<i>furcata</i>	d. Bounding	iv. Generalist	04. Common Resident
Asterales	Asteraceae	<i>Othonna</i>	<i>protecta</i>	d. Bounding	iv. Generalist	04. Common Resident
Asterales	Asteraceae	<i>Pechuel-Loeschea</i>	<i>leubnitziae</i>	d. Bounding	iv. Generalist	04. Common Resident
Asterales	Asteraceae	<i>Pentzia</i>	<i>hereroensis</i>	d. Bounding	iv. Generalist	04. Common Resident
Asterales	Asteraceae	<i>Pteronia</i>	<i>spinulosa</i>	d. Bounding	iv. Generalist	04. Common Resident

Order	Family	Genus	Species	NSS Biogeography	NSS Ecological range	NSS Status
Asterales	Asteraceae	<i>Senecio</i>	<i>flavus</i>	d. Bounding	iv. Generalist	04. Common Resident
Asterales	Asteraceae	<i>Tripteris</i>	<i>crassifolia</i>	d. Bounding	iv. Generalist	04. Common Resident
Asterales	Asteraceae	<i>Xanthium</i>	<i>spinosum</i>	d. Bounding	iv. Generalist	04. Common Resident
Boraginales	Bignoniaceae	<i>Cataphractes</i>	<i>alexandri</i>	d. Bounding	iv. Generalist	04. Common Resident
Boraginales	Bignoniaceae	<i>Rhigozum</i>	<i>trichotomum</i>	d. Bounding	iv. Generalist	04. Common Resident
Boraginales	Boraginaceae	<i>Heliotropium</i>	<i>ovalifolium</i>	d. Bounding	iv. Generalist	04. Common Resident
Boraginales	Boraginaceae	<i>Heliotropium</i>	<i>oliveranum</i>	d. Bounding	iv. Generalist	04. Common Resident
Boraginales	Boraginaceae	<i>Heliotropium</i>	<i>tubulosum</i>	d. Bounding	iv. Generalist	04. Common Resident
Boraginales	Boraginaceae	<i>Trichodesma</i>	<i>africana</i>	d. Bounding	iv. Generalist	04. Common Resident
Boraginales	Heliotropiaceae	<i>Cordia</i>	<i>gharaf</i>	d. Bounding	iv. Generalist	04. Common Resident
Boraginales	Heliotropiaceae	<i>Heliotropium</i>	<i>oliveranum</i>	d. Bounding	iv. Generalist	04. Common Resident
Boraginales	Hydrophyllaceae	<i>Codon</i>	<i>royenii</i>	d. Bounding	iv. Generalist	04. Common Resident
Boraginales	Hydrophyllaceae	<i>Codon</i>	<i>schenckii</i>	d. Bounding	iv. Generalist	04. Common Resident
Burserales	Burseraceae	<i>Commiphora</i>	<i>glaucescens</i>	d. Bounding	iv. Generalist	04. Common Resident
Burserales	Burseraceae	<i>Commiphora</i>	<i>saxicola</i>	d. Bounding	iv. Generalist	04. Common Resident
Burserales	Burseraceae	<i>Commiphora</i>	<i>tenuipetiolata</i>	d. Bounding	iv. Generalist	04. Common Resident
Capparales	Capparaceae	<i>Boscia</i>	<i>albitrunca</i>	d. Bounding	iv. Generalist	04. Common Resident
Capparales	Capparaceae	<i>Boscia</i>	<i>foetida</i>	d. Bounding	iv. Generalist	04. Common Resident
Capparales	Capparaceae	<i>Cadaba</i>	<i>aphylla</i>	d. Bounding	iv. Generalist	04. Common Resident
Capparales	Capparaceae	<i>Capparis</i>	<i>hereroensis</i>	d. Bounding	iv. Generalist	04. Common Resident
Capparales	Capparaceae	<i>Cleome</i>	<i>foliosa</i>	d. Bounding	iv. Generalist	04. Common Resident
Capparales	Capparaceae	<i>Maerua</i>	<i>parvifolia</i>	d. Bounding	iv. Generalist	04. Common Resident
Capparales	Capparaceae	<i>Maerua</i>	<i>schinzii</i>	d. Bounding	iv. Generalist	04. Common Resident
Caryophyllales	Aizoaceae	<i>Aizoanthemum</i>	<i>dinteri</i>	d. Bounding	iv. Generalist	04. Common Resident
Caryophyllales	Aizoaceae	<i>Aizoanthemum</i>	<i>galenioides</i>	d. Bounding	iv. Generalist	04. Common Resident
Caryophyllales	Aizoaceae	<i>Brownanthus</i>	<i>kuntzei</i>	d. Bounding	iv. Generalist	04. Common Resident
Caryophyllales	Aizoaceae	<i>Brownanthus</i>	<i>marlothii</i>	d. Bounding	iv. Generalist	04. Common Resident
Caryophyllales	Aizoaceae	<i>Brownanthus</i>	<i>namibensis</i>	d. Bounding	iv. Generalist	04. Common Resident
Caryophyllales	Aizoaceae	<i>Drosanthemum</i>	<i>luederitzii</i>	d. Bounding	iv. Generalist	04. Common Resident
Caryophyllales	Aizoaceae	<i>Drosanthemum</i>	<i>luederitzii</i>	d. Bounding	iv. Generalist	04. Common Resident
Caryophyllales	Aizoaceae	<i>Galenia</i>	<i>africanum</i>	d. Bounding	iv. Generalist	04. Common Resident
Caryophyllales	Aizoaceae	<i>Hereroa</i>	<i>puttkamerana</i>	d. Bounding	iii. Habitat specialist	05. Rare Resident
Caryophyllales	Aizoaceae	<i>Jensenobotrya</i>	<i>lossowiana</i>	d. Bounding	iii. Habitat specialist	05. Rare Resident
Caryophyllales	Aizoaceae	<i>Lithops</i>	<i>gracilidelineata</i>	d. Bounding	iii. Habitat specialist	05. Rare Resident

Order	Family	Genus	Species	NSS Biogeography	NSS Ecological range	NSS Status
Caryophyllales	Aizoaceae	<i>Lithops</i>	<i>ruschiorum</i>	d. Bounding	iii. Habitat specialist	05. Rare Resident
Caryophyllales	Aizoaceae	<i>Mesembryanthemum</i>	<i>cryptanthum</i>	d. Bounding	iv. Generalist	04. Common Resident
Caryophyllales	Aizoaceae	<i>Mesembryanthemum</i>	<i>guerichianum</i>	d. Bounding	iv. Generalist	04. Common Resident
Caryophyllales	Aizoaceae	<i>Psilocalaon</i>	<i>salicornioides</i>	d. Bounding	iii. Habitat specialist	04. Common Resident
Caryophyllales	Aizoaceae	<i>Sesuvium</i>	<i>sesuvioides</i>	d. Bounding	iv. Generalist	04. Common Resident
Caryophyllales	Aizoaceae	<i>Tetragonia</i>	<i>decumbens</i>	d. Bounding	iv. Generalist	04. Common Resident
Caryophyllales	Aizoaceae	<i>Trianthema</i>	<i>hereroensis</i>	a. Sand Sea	i. Dune Sea specialist	03. Near Endemic
Caryophyllales	Aizoaceae	<i>Trianthema</i>	<i>triquetra</i>	d. Bounding	iv. Generalist	04. Common Resident
Caryophyllales	Amaranthaceae	<i>Aerva</i>	<i>leucura</i>	d. Bounding	iv. Generalist	04. Common Resident
Caryophyllales	Amaranthaceae	<i>Arthroa</i>	<i>leubnitziae</i>	d. Bounding	ii. Arid area specialist	04. Common Resident
Caryophyllales	Amaranthaceae	<i>Calicorema</i>	<i>capitata</i>	d. Bounding	iv. Generalist	04. Common Resident
Caryophyllales	Amaryllidaceae	<i>Ammocharis</i>	<i>tinneana</i>	d. Bounding	iv. Generalist	04. Common Resident
Caryophyllales	Chenopodiaceae	<i>Atriplex</i>	<i>vestita</i>	d. Bounding	iv. Generalist	04. Common Resident
Caryophyllales	Chenopodiaceae	<i>Salsola</i>	<i>aphylla</i>	d. Bounding	iv. Generalist	04. Common Resident
Caryophyllales	Chenopodiaceae	<i>Salsola</i>	<i>nollothensis</i>	d. Bounding	iv. Generalist	04. Common Resident
Caryophyllales	Chenopodiaceae	<i>Salsola</i>	<i>tuberculata</i>	d. Bounding	iv. Generalist	04. Common Resident
Caryophyllales	Chenopodiaceae	<i>Sarcocornia</i>	<i>pillansii</i>	d. Bounding	iv. Generalist	04. Common Resident
Caryophyllales	Chenopodiaceae	<i>Sueda</i>	<i>plumosa</i>	d. Bounding	iv. Generalist	04. Common Resident
Caryophyllales	Molluginaceae	<i>Gisekia</i>	<i>africana</i>	d. Bounding	iv. Generalist	04. Common Resident
Caryophyllales	Molluginaceae	<i>Hypertelis</i>	<i>salsoloides</i>	d. Bounding	iv. Generalist	04. Common Resident
Caryophyllales	Molluginaceae	<i>Limeum</i>	<i>fenestratum</i>	d. Bounding	iv. Generalist	04. Common Resident
Caryophyllales	Nyctaginaceae	<i>Boerhavia</i>	<i>deserticola</i>	d. Bounding	iv. Generalist	04. Common Resident
Caryophyllales	Nyctaginaceae	<i>Boerhavia</i>	<i>hereroensis</i>	d. Bounding	iv. Generalist	04. Common Resident
Caryophyllales	Nyctaginaceae	<i>Commicarpus</i>	<i>squarrosus</i>	d. Bounding	iv. Generalist	04. Common Resident
Caryophyllales	Nyctaginaceae	<i>Phaeoptilum</i>	<i>spinsum</i>	d. Bounding	iv. Generalist	04. Common Resident
Caryophyllales	Portulacaceae	<i>Avonia</i>	<i>albissima</i>	d. Bounding	iii. Habitat specialist	04. Common Resident
Caryophyllales	Tetragoniaceae	<i>Tetragonia</i>	<i>schrenckii</i>	d. Bounding	iv. Generalist	04. Common Resident
Caryophyllales	Tetragoniaceae	<i>Tribulocarpus</i>	<i>dimorphanthus</i>	d. Bounding	iv. Generalist	04. Common Resident
Celastrales	Celastraceae	<i>Gymnosporia</i>	<i>senegalensis</i>	d. Bounding	iv. Generalist	04. Common Resident
Cucurbitales	Cucurbitaceae	<i>Acanthosicyos</i>	<i>horridus</i>	a. Sand Sea	i. Dune Sea specialist	03. Near Endemic
Cucurbitales	Cucurbitaceae	<i>Citrullus</i>	<i>ecirrhosus</i>	d. Bounding	iv. Generalist	04. Common Resident
Cucurbitales	Cucurbitaceae	<i>Cucumis</i>	<i>sagittatus</i>	d. Bounding	iv. Generalist	04. Common Resident
Euphorbiales	Euphorbiaceae	<i>Croton</i>	<i>gratissimus</i>	d. Bounding	iv. Generalist	04. Common Resident
Euphorbiales	Euphorbiaceae	<i>Euphorbia</i>	<i>glanduligera</i>	d. Bounding	iv. Generalist	04. Common Resident

Order	Family	Genus	Species	NSS Biogeography	NSS Ecological range	NSS Status
Euphorbiales	Euphorbiaceae	<i>Euphorbia</i>	<i>guerichiana</i>	d. Bounding	iv. Generalist	04. Common Resident
Euphorbiales	Euphorbiaceae	<i>Euphorbia</i>	<i>lignosa</i>	d. Bounding	iv. Generalist	04. Common Resident
Euphorbiales	Euphorbiaceae	<i>Euphorbia</i>	<i>mauritanica</i>	d. Bounding	iv. Generalist	04. Common Resident
Euphorbiales	Euphorbiaceae	<i>Euphorbia</i>	<i>phylloclada</i>	d. Bounding	iv. Generalist	04. Common Resident
Euphorbiales	Euphorbiaceae	<i>Euphorbia</i>	<i>virosa</i>	d. Bounding	iv. Generalist	04. Common Resident
Euphorbiales	Euphorbiaceae	<i>Ricinus</i>	<i>communis</i>	d. Bounding	iv. Generalist	12. Alien
Fabales	Fabaceae	<i>Acacia</i>	<i>erioloba</i>	c. Widespread	iv. Generalist	04. Common Resident
Fabales	Fabaceae	<i>Acacia</i>	<i>hebeclada</i>	d. Bounding	iv. Generalist	04. Common Resident
Fabales	Fabaceae	<i>Acacia</i>	<i>reficiens</i>	d. Bounding	iv. Generalist	04. Common Resident
Fabales	Fabaceae	<i>Acacia</i>	<i>tortilis</i>	d. Bounding	iv. Generalist	04. Common Resident
Fabales	Fabaceae	<i>Adenolobus</i>	<i>garipensis</i>	d. Bounding	iv. Generalist	04. Common Resident
Fabales	Fabaceae	<i>Adenolobus</i>	<i>pechuelii</i>	d. Bounding	iv. Generalist	04. Common Resident
Fabales	Fabaceae	<i>Caesalpinia</i>	<i>pearsonii</i>	d. Bounding	iv. Generalist	04. Common Resident
Fabales	Fabaceae	<i>Crotalaria</i>	<i>damarensis</i>	d. Bounding	iv. Generalist	04. Common Resident
Fabales	Fabaceae	<i>Faidherbia</i>	<i>albida</i>	d. Bounding	iii. Habitat specialist	04. Common Resident
Fabales	Fabaceae	<i>Indigofera</i>	<i>auricoma</i>	d. Bounding	iv. Generalist	04. Common Resident
Fabales	Fabaceae	<i>Lebeckia</i>	<i>multiflora</i>	d. Bounding	iv. Generalist	04. Common Resident
Fabales	Fabaceae	<i>Otoptera</i>	<i>burchellii</i>	d. Bounding	iv. Generalist	04. Common Resident
Fabales	Fabaceae	<i>Parkinsonia</i>	<i>africana</i>	d. Bounding	iv. Generalist	04. Common Resident
Fabales	Fabaceae	<i>Prosopis</i>	<i>glandulosa</i>	d. Bounding	iv. Generalist	12. Alien
Fabales	Fabaceae	<i>Cullen</i>	<i>obtusifolia</i>	d. Bounding	iv. Generalist	04. Common Resident
Fabales	Fabaceae	<i>Sesbania</i>	<i>pachycarpa</i>	d. Bounding	iv. Generalist	04. Common Resident
Fabales	Fabaceae	<i>Tephrosia</i>	<i>dregeana</i>	d. Bounding	iv. Generalist	04. Common Resident
Gentianales	Asclepiadaceae	<i>Sarcostemma</i>	<i>viminale</i>	d. Bounding	iv. Generalist	04. Common Resident
Gentianales	Asclepiadaceae	<i>Trichocaulon</i>	<i>clavatum</i>	d. Bounding	iii. Habitat specialist	04. Common Resident
Gentianales	Rubiaceae	<i>Kohautia</i>	<i>cynanchica</i>	d. Bounding	iv. Generalist	04. Common Resident
Geraniales	Geraniaceae	<i>Monsonia</i>	<i>ignorata</i>	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic
Geraniales	Geraniaceae	<i>Monsonia</i>	<i>senegalensis</i>	d. Bounding	iv. Generalist	04. Common Resident
Geraniales	Geraniaceae	<i>Sarcocaulon</i>	<i>marlothii</i>	d. Bounding	iv. Generalist	04. Common Resident
Geraniales	Geraniaceae	<i>Sarcocaulon</i>	<i>mossamedense</i>	d. Bounding	iv. Generalist	04. Common Resident
Geraniales	Geraniaceae	<i>Sarcocaulon</i>	<i>salmoniflorum</i>	d. Bounding	iv. Generalist	04. Common Resident
Gunnerales	Myrothamnaceae	<i>Myrothamnus</i>	<i>flabellifolius</i>	d. Bounding	iii. Habitat specialist	04. Common Resident
Lamiales	Acanthaceae	<i>Barleria</i>	<i>lancifolia</i>	d. Bounding	iv. Generalist	04. Common Resident
Lamiales	Acanthaceae	<i>Blepharis</i>	<i>grossa</i>	d. Bounding	iv. Generalist	04. Common Resident

Order	Family	Genus	Species	NSS Biogeography	NSS Ecological range	NSS Status
Lamiales	Acanthaceae	<i>Blepharis</i>	<i>obmitrata</i>	d. Bounding	iv. Generalist	04. Common Resident
Lamiales	Acanthaceae	<i>Monechma</i>	<i>arenicola</i>	d. Bounding	iv. Generalist	04. Common Resident
Lamiales	Acanthaceae	<i>Monechma</i>	<i>desertorum</i>	d. Bounding	iv. Generalist	04. Common Resident
Lamiales	Acanthaceae	<i>Monechma</i>	<i>genistifolium</i>	d. Bounding	iv. Generalist	04. Common Resident
Lamiales	Acanthaceae	<i>Petalidium</i>	<i>setosum</i>	d. Bounding	iv. Generalist	04. Common Resident
Lamiales	Acanthaceae	<i>Petalidium</i>	<i>variabile</i>	d. Bounding	iv. Generalist	04. Common Resident
Lamiales	Acanthaceae	<i>Ryellia</i>	<i>diversifolia</i>	d. Bounding	iv. Generalist	04. Common Resident
Lamiales	Lamiaceae	<i>Salvia</i>	<i>garipensis</i>	d. Bounding	iv. Generalist	04. Common Resident
Lamiales	Oleaceae	<i>Olea</i>	<i>europaea subsp.africana</i>	d. Bounding	iv. Generalist	04. Common Resident
Lamiales	Pedaliaceae	<i>Harpagophytum</i>	<i>procumbens</i>	d. Bounding	iv. Generalist	04. Common Resident
Lamiales	Pedaliaceae	<i>Rogeria</i>	<i>longiflora</i>	d. Bounding	iv. Generalist	04. Common Resident
Lamiales	Pedaliaceae	<i>Sesamum</i>	<i>abbreviatum</i>	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic
Lamiales	Pedaliaceae	<i>Sesamum</i>	<i>capense</i>	d. Bounding	iv. Generalist	04. Common Resident
Lamiales	Pedaliaceae	<i>Sesamum</i>	<i>marlothii</i>	d. Bounding	iv. Generalist	04. Common Resident
Lamiales	Pedaliaceae	<i>Sesamum</i>	<i>triphillum</i>	d. Bounding	iv. Generalist	04. Common Resident
Lamiales	Scrophulariaceae	<i>Alectra</i>	<i>pseudobarleriae</i>	d. Bounding	iv. Generalist	04. Common Resident
Lamiales	Scrophulariaceae	<i>Anticharis</i>	<i>inflata</i>	d. Bounding	iv. Generalist	04. Common Resident
Lamiales	Scrophulariaceae	<i>Aptosimum</i>	<i>spinescens</i>	d. Bounding	iv. Generalist	04. Common Resident
Lamiales	Scrophulariaceae	<i>Jamesbrittenia</i>	<i>hereroensis</i>	d. Bounding	iv. Generalist	04. Common Resident
Lamiales	Scrophulariaceae	<i>Jamesbrittenia</i>	<i>maxii</i>	d. Bounding	iv. Generalist	04. Common Resident
Lamiales	Scrophulariaceae	<i>Striga</i>	<i>gesnerioides</i>	d. Bounding	iii. Habitat specialist	04. Common Resident
Lamiales	Scrophulariaceae	<i>Veronica</i>	<i>anagallis-aquatica</i>	d. Bounding	iv. Generalist	04. Common Resident
Lamiales	Selaginaceae	<i>Walafrida</i>	<i>nachtigalii</i>	d. Bounding	iv. Generalist	04. Common Resident
Lamiales	Verbenaceae	<i>Chascanum</i>	<i>garipense</i>	d. Bounding	iv. Generalist	04. Common Resident
Loasales	Loasaceae	<i>Kissenia</i>	<i>capensis</i>	d. Bounding	iv. Generalist	04. Common Resident
Malpighiales	Passifloraceae	<i>Adenia</i>	<i>pechuelii</i>	d. Bounding	iv. Generalist	04. Common Resident
Malvales	Malvaceae	<i>Gossypium</i>	<i>anomalum</i>	d. Bounding	iv. Generalist	04. Common Resident
Malvales	Malvaceae	<i>Hibiscus</i>	<i>dinteri</i>	d. Bounding	iv. Generalist	04. Common Resident
Malvales	Malvaceae	<i>Hibiscus</i>	<i>engleri</i>	d. Bounding	iv. Generalist	04. Common Resident
Malvales	Malvaceae	<i>Radyera</i>	<i>urens</i>	d. Bounding	iv. Generalist	04. Common Resident
Malvales	Neuradaceae	<i>Grelium</i>	<i>sinuatum</i>	d. Bounding	iv. Generalist	04. Common Resident
Malvales	Sterculiaceae	<i>Dombeya</i>	<i>rotundifolia</i>	d. Bounding	iv. Generalist	04. Common Resident
Malvales	Sterculiaceae	<i>Hermannia</i>	<i>amabilis</i>	d. Bounding	iv. Generalist	04. Common Resident
Malvales	Sterculiaceae	<i>Hermannia</i>	<i>elliottiana</i>	d. Bounding	iv. Generalist	04. Common Resident

Order	Family	Genus	Species	NSS Biogeography	NSS Ecological range	NSS Status
Malvales	Sterculiaceae	<i>Hermannia</i>	<i>minimifolia</i>	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic
Malvales	Sterculiaceae	<i>Sterculia</i>	<i>africana</i>	d. Bounding	iv. Generalist	04. Common Resident
Malvales	Tiliaceae	<i>Grewia</i>	<i>bicolor</i>	d. Bounding	iv. Generalist	04. Common Resident
Malvales	Tiliaceae	<i>Grewia</i>	<i>flavescens</i>	d. Bounding	iv. Generalist	04. Common Resident
Montinales	Montiniaceae	<i>Montinia</i>	<i>caryophyllacea</i>	d. Bounding	iv. Generalist	04. Common Resident
Moringales	Moringaceae	<i>Moringa</i>	<i>ovalifolia</i>	d. Bounding	iv. Generalist	04. Common Resident
Oxalidales	Oxalidaceae	<i>Oxalis</i>	<i>purpurascens</i>	d. Bounding	iv. Generalist	04. Common Resident
Plumbaginales	Plumbaginaceae	<i>Dyerophytum</i>	<i>africanum</i>	d. Bounding	iv. Generalist	04. Common Resident
Plumbaginales	Plumbaginaceae	<i>Limonium</i>	<i>dyeri</i>	d. Bounding	iv. Generalist	04. Common Resident
Ranunculales	Papaveraceae	<i>Argemone</i>	<i>orchroleuca</i>	d. Bounding	iv. Generalist	04. Common Resident
Rosales	Rhamnaceae	<i>Ziziphus</i>	<i>mucronata</i>	d. Bounding	iv. Generalist	04. Common Resident
Rosales	Urticaceae	<i>Forsskaolea</i>	<i>hereroensis</i>	d. Bounding	iv. Generalist	04. Common Resident
Rosales	Urticaceae	<i>Forsskaolea</i>	<i>viridis</i>	d. Bounding	iv. Generalist	04. Common Resident
Salvadorales	Salvadoraceae	<i>Salvadora</i>	<i>persica</i>	d. Bounding	ii. Arid area specialist	04. Common Resident
Sapindales	Anacardiaceae	<i>Ozoroa</i>	<i>crassinervia</i>	d. Bounding	iv. Generalist	04. Common Resident
Sapindales	Anacardiaceae	<i>Searsia</i>	<i>marlothii</i>	d. Bounding	iv. Generalist	04. Common Resident
Sapindales	Sapindaceae	<i>Cardiospermum</i>	<i>pechuelii</i>	d. Bounding	iv. Generalist	04. Common Resident
Saxifragales	Crassulaceae	<i>Cotyledon</i>	<i>orbiculata</i>	d. Bounding	iv. Generalist	04. Common Resident
Saxifragales	Vahliaceae	<i>Vahlia</i>	<i>capensis</i>	d. Bounding	iv. Generalist	04. Common Resident
Solanales	Convolvulaceae	<i>Ipomoea</i>	<i>adenioides</i>	d. Bounding	iv. Generalist	04. Common Resident
Solanales	Convolvulaceae	<i>Merremia</i>	<i>bipinnatipartita</i>	d. Bounding	iv. Generalist	04. Common Resident
Solanales	Solanaceae	<i>Datura</i>	<i>ferox</i>	d. Bounding	iv. Generalist	12. Alien
Solanales	Solanaceae	<i>Datura</i>	<i>innoxia</i>	d. Bounding	iv. Generalist	12. Alien
Solanales	Solanaceae	<i>Datura</i>	<i>metel</i>	d. Bounding	iv. Generalist	12. Alien
Solanales	Solanaceae	<i>Datura</i>	<i>stramonium</i>	d. Bounding	iv. Generalist	12. Alien
Solanales	Solanaceae	<i>Lycium</i>	<i>cinereum</i>	d. Bounding	iv. Generalist	04. Common Resident
Solanales	Solanaceae	<i>Lycium</i>	<i>decumbens</i>	d. Bounding	iv. Generalist	04. Common Resident
Solanales	Solanaceae	<i>Lycium</i>	<i>oxycarpum</i>	d. Bounding	iv. Generalist	04. Common Resident
Solanales	Solanaceae	<i>Lycium</i>	<i>tetrandrum</i>	d. Bounding	iv. Generalist	04. Common Resident
Solanales	Solanaceae	<i>Nicotiana</i>	<i>glauca</i>	d. Bounding	iv. Generalist	12. Alien
Styracales	Ebenaceae	<i>Euclea</i>	<i>pseudebenus</i>	d. Bounding	iv. Generalist	04. Common Resident
Tamaricales	Tamaricaceae	<i>Tamarix</i>	<i>usneoides</i>	d. Bounding	ii. Arid area specialist	04. Common Resident
Urticales	Moraceae	<i>Ficus</i>	<i>cordata</i>	d. Bounding	iv. Generalist	04. Common Resident
Urticales	Moraceae	<i>Ficus</i>	<i>guerichiana</i>	d. Bounding	iv. Generalist	04. Common Resident

Order	Family	Genus	Species	NSS Biogeography	NSS Ecological range	NSS Status
Urticales	Moraceae	<i>Ficus</i>	<i>sycomorus</i>	d. Bounding	iv. Generalist	04. Common Resident
Vitales	Vitaceae	<i>Cyphostemma</i>	<i>currorii</i>	d. Bounding	iv. Generalist	04. Common Resident
Zygophyllales	Zygophyllaceae	<i>Tribulus</i>	<i>terrestris</i>	d. Bounding	iv. Generalist	04. Common Resident
Zygophyllales	Zygophyllaceae	<i>Tribulus</i>	<i>zeyheri</i>	d. Bounding	iv. Generalist	04. Common Resident
Zygophyllales	Zygophyllaceae	<i>Zygophyllum</i>	<i>clavatum</i>	d. Bounding	iv. Generalist	04. Common Resident
Zygophyllales	Zygophyllaceae	<i>Zygophyllum</i>	<i>cylindrifolium</i>	d. Bounding	iv. Generalist	04. Common Resident
Zygophyllales	Zygophyllaceae	<i>Zygophyllum</i>	<i>simplex</i>	d. Bounding	iv. Generalist	04. Common Resident
Zygophyllales	Zygophyllaceae	<i>Zygophyllum</i>	<i>stapffii</i>	d. Bounding	ii. Arid area specialist	04. Common Resident
Kingdom: Plantae	Phylum: Angiospermophyta	Class: Liliopsida				
Alismatales	Aponogetonaceae	<i>Aponogeton</i>	<i>desertorum</i>	d. Bounding	iv. Generalist	04. Common Resident
Asparagales	Asparagaceae	<i>Asparagus</i>	<i>pearsonii</i>	d. Bounding	iv. Generalist	04. Common Resident
Asparagales	Asphodelaceae	<i>Aloe</i>	<i>asperifolia</i>	d. Bounding	iv. Generalist	04. Common Resident
Asparagales	Asphodelaceae	<i>Aloe</i>	<i>hereroensis</i>	d. Bounding	iv. Generalist	04. Common Resident
Asparagales	Asphodelaceae	<i>Aloe</i>	<i>namibensis</i>	d. Bounding	iv. Generalist	04. Common Resident
Asparagales	Ruscaceae	<i>Eriospermum</i>	<i>tortuosum</i>	d. Bounding	iv. Generalist	04. Common Resident
Colchicales	Colchicaceae	<i>Hexacyrtis</i>	<i>dickiana</i>	a. Sand Sea	i. Dune Sea specialist	03. Near Endemic
Colchicales	Colchicaceae	<i>Ornithoglossum</i>	<i>dinteri</i>	d. Bounding	iv. Generalist	04. Common Resident
Colchicales	Colchicaceae	<i>Ornithoglossum</i>	<i>viride</i>	d. Bounding	iv. Generalist	04. Common Resident
Cyperales	Cyperaceae	<i>Cyperus</i>	<i>laevigatus</i>	d. Bounding	iii. Habitat specialist	04. Common Resident
Cyperales	Cyperaceae	<i>Cyperus</i>	<i>marginatus</i>	d. Bounding	iii. Habitat specialist	04. Common Resident
Cyperales	Cyperaceae	<i>Cyperus</i>	<i>schinzii</i>	d. Bounding	iii. Habitat specialist	04. Common Resident
Cyperales	Cyperaceae	<i>Bulbostylis</i>	<i>hispidula</i>	d. Bounding	iii. Habitat specialist	04. Common Resident
Cyperales	Cyperaceae	<i>Scirpoides</i>	<i>dioecus</i>	d. Bounding	iii. Habitat specialist	04. Common Resident
Poales	Poaceae	<i>Aristida</i>	<i>parvula</i>	d. Bounding	iv. Generalist	04. Common Resident
Poales	Poaceae	<i>Arundo</i>	<i>donax</i>	d. Bounding	iv. Generalist	04. Common Resident
Poales	Poaceae	<i>Brachiara</i>	<i>glomerata</i>	d. Bounding	iv. Generalist	04. Common Resident
Poales	Poaceae	<i>Centropodia</i>	<i>glauca</i>	a. Sand Sea	i. Dune Sea specialist	04. Common Resident
Poales	Poaceae	<i>Chloris</i>	<i>virgata</i>	d. Bounding	iv. Generalist	04. Common Resident
Poales	Poaceae	<i>Cladoraphis</i>	<i>cyperoides</i>	d. Bounding	iv. Generalist	04. Common Resident
Poales	Poaceae	<i>Cladoraphis</i>	<i>spinosa</i>	a. Sand Sea	i. Dune Sea specialist	04. Common Resident
Poales	Poaceae	<i>Cynodon</i>	<i>dactylon</i>	d. Bounding	iv. Generalist	04. Common Resident
Poales	Poaceae	<i>Enneapogon</i>	<i>brachystachyus</i>	d. Bounding	iv. Generalist	04. Common Resident
Poales	Poaceae	<i>Eragrostis</i>	<i>annulata</i>	d. Bounding	iv. Generalist	04. Common Resident
Poales	Poaceae	<i>Eragrostis</i>	<i>cylindriflora</i>	d. Bounding	iv. Generalist	04. Common Resident

Order	Family	Genus	Species	NSS Biogeography	NSS Ecological range	NSS Status
Poales	Poaceae	<i>Cladoraphis</i>	<i>cyperoides</i>	e. Sandwich	iv. Generalist	04. Common Resident
Poales	Poaceae	<i>Eragrostis</i>	<i>porosa</i>	d. Bounding	iv. Generalist	04. Common Resident
Poales	Poaceae	<i>Odyssea</i>	<i>paucinervis</i>	d. Bounding	iv. Generalist	04. Common Resident
Poales	Poaceae	<i>Phragmites</i>	<i>australis</i>	e. Sandwich	iii. Habitat specialist	04. Common Resident
Poales	Poaceae	<i>Schmidtia</i>	<i>kalahariensis</i>	c. Widespread	iv. Generalist	04. Common Resident
Poales	Poaceae	<i>Setaria</i>	<i>verticillata</i>	d. Bounding	iv. Generalist	04. Common Resident
Poales	Poaceae	<i>Sporobolus</i>	<i>nebulosus</i>	d. Bounding	iv. Generalist	04. Common Resident
Poales	Poaceae	<i>Sporobolus</i>	<i>virginicus</i>	d. Bounding	iv. Generalist	04. Common Resident
Poales	Poaceae	<i>Stipagrostis</i>	<i>ciliata</i>	d. Bounding	iv. Generalist	04. Common Resident
Poales	Poaceae	<i>Stipagrostis</i>	<i>gonatostachys</i>	a. Sand Sea	i. Dune Sea specialist	03. Near Endemic
Poales	Poaceae	<i>Stipagrostis</i>	<i>hermannii</i>	d. Bounding	iv. Generalist	04. Common Resident
Poales	Poaceae	<i>Stipagrostis</i>	<i>hirtigluma</i>	d. Bounding	iv. Generalist	04. Common Resident
Poales	Poaceae	<i>Stipagrostis</i>	<i>hochstetteriana</i>	d. Bounding	iv. Generalist	04. Common Resident
Poales	Poaceae	<i>Stipagrostis</i>	<i>lutescens</i>	a. Sand Sea	i. Dune Sea specialist	04. Common Resident
Poales	Poaceae	<i>Stipagrostis</i>	<i>namaquensis</i>	d. Bounding	iv. Generalist	04. Common Resident
Poales	Poaceae	<i>Stipagrostis</i>	<i>obtusa</i>	d. Bounding	iv. Generalist	04. Common Resident
Poales	Poaceae	<i>Stipagrostis</i>	<i>pellytronis</i>	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic
Poales	Poaceae	<i>Stipagrostis</i>	<i>sabulicola</i>	a. Sand Sea	i. Dune Sea specialist	03. Near Endemic
Poales	Poaceae	<i>Stipagrostis</i>	<i>seelyae</i>	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic
Poales	Poaceae	<i>Stipagrostis</i>	<i>subacaulis</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Poales	Poaceae	<i>Stipagrostis</i>	<i>uniplumis</i>	d. Bounding	iv. Generalist	04. Common Resident
Poales	Poaceae	<i>Triraphis</i>	<i>pumilio</i>	d. Bounding	iv. Generalist	04. Common Resident
Poales	Poaceae	<i>Triraphis</i>	<i>purpurea</i>	d. Bounding	iv. Generalist	04. Common Resident
Poales	Poaceae	<i>Triraphis</i>	<i>ramosissima</i>	d. Bounding	iv. Generalist	04. Common Resident
Typhales	Typhaceae	<i>Typha</i>	<i>capensis</i>	e. Sandwich	iii. Habitat specialist	04. Common Resident

Note: status of common resident means common in its preferred habitat, not common throughout the area.

Annex 11

Table of Invertebrates & Protista



Kingdom	Phylum	Class	Order	Family	Genus	Species
Animalia	Mollusca	Bivalvia	Myoida	Hiatellidae	<i>Panopea</i>	<i>glycymeris</i>
Animalia	Mollusca	Bivalvia	Veneroida	Petricolidae	<i>Petricola</i>	<i>bicolor</i>
Animalia	Mollusca	Gastropoda	Mesogastropoda	Naticidae	<i>Natica</i>	<i>vittata</i>
Animalia	Cnidaria	Hydrozoa	Hydroida	Plumulariidae	<i>Aglaophenia</i>	<i>pluma</i>
Animalia	Rotifera	Monogononta	Ploima	Proalidae	<i>Proales</i>	<i>similis</i>
Animalia	Nematoda	Adenophorea	Monhysterida	Monhysteridae	<i>Monhystrella</i>	<i>lepidura</i>
Animalia	Nematoda	Adenophorea	Monhysterida	Monhysteridae	<i>Monhystrella</i>	<i>paramacrura</i>
Animalia	Nematoda	Secernentea	Rhabditida	Cephalobidae	<i>Acrobeles</i>	<i>ciliatus</i>
Animalia	Nematoda	Secernentea	Rhabditida	Cephalobidae	<i>Acrobeles</i>	<i>seelyae</i>
Animalia	Nematoda	Secernentea	Rhabditida	Cephalobidae	<i>Chiloplacus</i>	<i>longiuterus</i>
Animalia	Nematoda	Secernentea	Rhabditida	Cephalobidae	<i>Chiloplacus</i>	<i>magnus</i>
Animalia	Nematoda	Secernentea	Rhabditida	Cephalobidae	<i>Namibinema</i>	<i>scaphovulva</i>
Animalia	Nematoda	Secernentea	Rhabditida	Cephalobidae	<i>Paracrobeles</i>	<i>laterellus</i>
Animalia	Nematoda	Secernentea	Rhabditida	Cephalobidae	<i>Seleborca</i>	<i>complexa</i>
Animalia	Nematoda	Secernentea	Rhabditida	Cephalobidae	<i>Seleborca</i>	<i>mariannae</i>
Animalia	Nematoda	Secernentea	Rhabditida	Cephalobidae	<i>Seleborca</i>	<i>welwitschiae</i>
Animalia	Nematoda	Secernentea	Rhabditida	Cephalobidae	<i>Zeldia</i>	<i>punctata</i>
Animalia	Nematoda	Secernentea	Tylenchida	Telotylenchidae	<i>Tylenchorhynchus</i>	<i>brevilineatus</i>
Animalia	Nematoda	Secernentea	Tylenchida	Telotylenchidae	<i>Tylenchorhynchus</i>	<i>namibiensis</i>
Animalia	Annelida	Oligochaeta	Hirudinea	Glossiphoniidae	<i>Placobdelloides</i>	<i>multistriata</i>
Animalia	Annelida	Oligochaeta	Hirudinea	Hirudinidae	<i>Aliolimnatis</i>	<i>obscura</i>
Animalia	Annelida	Oligochaeta	Lumbriculida	Naididae	<i>Nais</i>	<i>pseudobtusa</i>
Animalia	Annelida	Oligochaeta	Lumbriculida	Tubificidae	<i>Limnodriloides</i>	<i>winckelmanni</i>
Animalia	Annelida	Polychaeta	Sedentaria	Sabellidae	<i>Desdemona</i>	<i>ornata</i>
Animalia	Arthropoda	Branchiopoda	Anostraca	Branchipodidae	<i>Branchipodopsis</i>	<i>tridens</i>
Animalia	Arthropoda	Branchiopoda	Anostraca	Branchipodidae	<i>Pumiliobranchnus</i>	<i>deserti</i>
Animalia	Arthropoda	Branchiopoda	Anostraca	Streptocephalidae	<i>Streptocephalus</i>	<i>namibiensis</i>
Animalia	Arthropoda	Branchiopoda	Conchostraca	Leptestheridae	<i>Leptestheriella</i>	<i>inermis</i>
Animalia	Arthropoda	Branchiopoda	Notostraca	Triopsidae	<i>Triops</i>	<i>cancriformis</i>

Kingdom	Phylum	Class	Order	Family	Genus	Species
Animalia	Arthropoda	Malacostraca	Amphipoda	Ampeliscidae	<i>Ampelisca</i>	<i>brevicornis</i>
Animalia	Arthropoda	Malacostraca	Amphipoda	Ampeliscidae	<i>Ampelisca</i>	<i>palmata</i>
Animalia	Arthropoda	Malacostraca	Cumacea	Bodotriidae	<i>Upselaspis</i>	<i>caparti</i>
Animalia	Arthropoda	Malacostraca	Leptostraca	Phyllocaridae	<i>Nebalia</i>	<i>capensis</i>
Animalia	Arthropoda	Malacostraca	Leptostraca	Phyllocaridae	<i>Nebalia</i>	<i>ilheoensis</i>
Animalia	Arthropoda	Maxillopoda	Calanoida	Diaptomidae	<i>Metadiaptomus</i>	<i>meridianus</i>
Animalia	Arthropoda	Maxillopoda	Cladocera	Daphniidae	<i>Ctenodaphnia</i>	<i>dubia</i>
Animalia	Arthropoda	Maxillopoda	Cladocera	Moinidae	<i>Moina</i>	<i>belli</i>
Animalia	Arthropoda	Maxillopoda	Cladocera	Moinidae	<i>Moina</i>	<i>macrura</i>
Animalia	Arthropoda	Maxillopoda	Copepoda	Cyclopidae	<i>Eucyclops</i>	<i>gibsoni</i>
Animalia	Arthropoda	Maxillopoda	Copepoda	Cyclopidae	<i>Mesocyclops</i>	<i>oblongatus</i>
Animalia	Arthropoda	Maxillopoda	Ostracoda	Cypridae	<i>Apateleocypris</i>	<i>schultzei</i>
Animalia	Arthropoda	Maxillopoda	Ostracoda	Cypridae	<i>Heterocypris</i>	<i>congenera</i>
Animalia	Arthropoda	Maxillopoda	Ostracoda	Cypridae	<i>Sarscypridopsis</i>	<i>ochracea</i>
Animalia	Arthropoda	Maxillopoda	Ostracoda	Cypridae	<i>Sclerocypris</i>	<i>dayae</i>
Animalia	Arthropoda	Ellipura	Collembola	Hypogastruridae	<i>Willemia</i>	<i>namibiae</i>
Animalia	Arthropoda	Ellipura	Collembola	Isotomidae	<i>Folsomides</i>	<i>angularis</i>
Animalia	Arthropoda	Ellipura	Collembola	Isotomidae	<i>Folsomides</i>	<i>parvulus</i>
Animalia	Arthropoda	Ellipura	Collembola	Poduridae	<i>Anurida</i>	<i>maritima</i>

Kingdom	Phylum	Class	Order	Family	Genus	Species
Protista	Chlorophycota	Conjugophyceae	Zygnematales	Desmidiaceae	<i>Closterium</i>	<i>tumidulum</i>
Protista	Chlorophycota	Conjugophyceae	Zygnematales	Zygnemataceae	<i>Spirogyra</i>	<i>cylindrica</i>
Protista	Chlorophycota	Conjugophyceae	Zygnematales	Zygnemataceae	<i>Spirogyra</i>	<i>spreiana</i>
Protista	Chlorophycota	Conjugophyceae	Zygnematales	Zygnemataceae	<i>Spirogyra</i>	<i>welwitschii</i>

Annex 12

Table of Arachnids



Namib Sand Sea Biogeography Biogeography description

- a. Sand Sea Sand Sea inhabitants rarely ranging outside dune habitats
- b. Inselbergs Petrophilous inselberg inhabitants occurring as isolated populations within the Sand Sea
- c. Widespread May inhabit any part of the property due to vagility and catholic ecological choice
- d. Boundinging Mostly found adjacent to the Sand Sea and contributing to biodiversity and ecology through suitable habitat inside the property, marginally intruding or absent from dunes
- e. Sandwich Ramsar Specific Sandwich Harbour Ramsar site inhabitants

Ecological range

- i. Dune Sea specialist
- ii. Arid area specialist
- iii. Habitat specialist
- iv. Generalist

Ecological range description

- Psammophilous species restricted to Namib Biome sand dunes
- Euryaceous species restricted to arid biome habitats
- Stenotypic species, habitat, host or prey specific
- Not habitat specific with wide ecological choice

Status

- 01. Strict Endemic
- 02. Dune Endemic
- 03. Near Endemic
- 04. Common Resident
- 05. Rare Resident
- 06. Relict
- 07. Interdigitated resident
- 08. Marginal presence
- 09. Common migrant
- 10. Intermittent visitor
- 11. Vagrant
- 12. Alien
- 13. Domesticated

Status Description

- Psammophilous species only found in Namib Sand Sea
- Psammophilous species in Namib Sand Sea, range extend to outer Namib Biome dune areas
- Restricted to Namib Biomes
- Common throughout Namib Sand Sea property
- Rarely recorded from Namib Sand Sea property, not unexpected
- Isolated healthy populations in Namib Sand Sea far from core species range
- Readily found inside the property at suitable habitat intruding into the Sand Sea
- Incidental presence within the property from range overspill
- Present whenever conditions are suitable
- Rarely occur only when conditions are suitable
- Unusual and isolated records
- Feral populations of extralimital species
- Introduced alien species that is managed, occasionally vagrant

Class	Order	Family	Genus	Species	NSS Biogeography	NSS Ecological range	NSS Status
Kingdom: Animalia		Phylum: Arthropoda					
Chelicerata	Araneae	Ammoxenidae	<i>Ammoxenus</i>	<i>coccineus</i>	c. Widespread	iii. Habitat specialist	04. Common Resident
Chelicerata	Araneae	Ammoxenidae	<i>Rastellus</i>	<i>sabulosus</i>	a. Sand Sea	iii. Habitat specialist	02. Dune Endemic
Chelicerata	Araneae	Ammoxenidae	<i>Rastellus</i>	<i>narubis</i>	d. Bounding	ii. Arid area specialist	04. Common Resident
Chelicerata	Araneae	Ammoxenidae	<i>Rastellus</i>	<i>struthio</i>	d. Bounding	ii. Arid area specialist	04. Common Resident
Chelicerata	Araneae	Araneidae	<i>Argiope</i>	<i>nigrovittata</i>	d. Bounding	iv. Generalist	09. Common migrant
Chelicerata	Araneae	Caponiidae	<i>Diploglena</i>	<i>capensis</i>	d. Bounding	iii. Habitat specialist	05. Rare Resident
Chelicerata	Araneae	Eresidae	<i>Gandanameno</i>	<i>echinatus</i>	d. Bounding	iv. Generalist	04. Common Resident
Chelicerata	Araneae	Eresidae	<i>Seothyra</i>	<i>henscheli</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Chelicerata	Araneae	Eresidae	<i>Seothyra</i>	<i>longipedata</i>	d. Bounding	iv. Generalist	05. Rare Resident
Chelicerata	Araneae	Eresidae	<i>Stegodyphus</i>	<i>bicolor</i>	d. Bounding	iv. Generalist	05. Rare Resident
Chelicerata	Araneae	Eresidae	<i>Stegodyphus</i>	<i>dumicola</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Chelicerata	Araneae	Gnaphosidae	<i>Asemesthes</i>	<i>lineatus</i>	d. Bounding	iv. Generalist	04. Common Resident
Chelicerata	Araneae	Gnaphosidae	<i>Camillina</i>	<i>namibensis</i>	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic
Chelicerata	Araneae	Gnaphosidae	<i>Xerophaeus</i>	<i>perversus</i>	d. Bounding	iv. Generalist	04. Common Resident
Chelicerata	Araneae	Lycosidae	<i>Lycorma</i>	<i>hereroana</i>	d. Bounding	ii. Arid area specialist	05. Rare Resident
Chelicerata	Araneae	Lycosidae	<i>Lycorma</i>	<i>luderitzi</i>	d. Bounding	iii. Habitat specialist	05. Rare Resident
Chelicerata	Araneae	Lycosidae	<i>Lycosa</i>	<i>swakopmundensis</i>	d. Bounding	iv. Generalist	05. Rare Resident
Chelicerata	Araneae	Lycosidae	<i>Proevippa</i>	<i>albiventris</i>	d. Bounding	iv. Generalist	04. Common Resident
Chelicerata	Araneae	Lycosidae	<i>Trochosippa</i>	<i>eberlanzi</i>	d. Bounding	iii. Habitat specialist	05. Rare Resident
Chelicerata	Araneae	Pisauridae	<i>Thalassius</i>	<i>margaritatus</i>	e. Sandwich	iii. Habitat specialist	05. Rare Resident
Chelicerata	Araneae	Agelenidae	<i>Olorunia</i>	<i>ocellata</i>	d. Bounding	iv. Generalist	04. Common Resident
Chelicerata	Araneae	Nemesiidae	<i>Hermacha</i>	<i>lanata</i>	d. Bounding	iv. Generalist	04. Common Resident
Chelicerata	Araneae	Oecobiidae	<i>Uroctea</i>	<i>semilimbata</i>	d. Bounding	iv. Generalist	04. Common Resident
Chelicerata	Araneae	Oxyopidae	<i>Peucetia</i>	<i>viridis</i>	d. Bounding	iv. Generalist	04. Common Resident
Chelicerata	Araneae	Palpimanidae	<i>Diaphorocellus</i>	<i>biplagiata</i>	d. Bounding	iv. Generalist	04. Common Resident
Chelicerata	Araneae	Palpimanidae	<i>Palpimanus</i>	<i>stridulator</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Chelicerata	Araneae	Palpimanidae	<i>Palpimanus</i>	<i>namaquensis</i>	d. Bounding	ii. Arid area specialist	04. Common Resident
Chelicerata	Araneae	Philodromidae	<i>Hirriusa</i>	<i>bidentatus</i>	d. Bounding	iv. Generalist	08. Marginal presence
Chelicerata	Araneae	Pholcidae	<i>Smeringopus</i>	<i>atomarius</i>	c. Widespread	iv. Generalist	04. Common Resident
Chelicerata	Araneae	Pholcidae	<i>Smeringopus</i>	<i>pallidus</i>	d. Bounding	iv. Generalist	12. Alien
Chelicerata	Araneae	Pholcidae	<i>Pholcus</i>	<i>phalangioides</i>	d. Bounding	iv. Generalist	12. Alien
Chelicerata	Araneae	Prodidomidae	<i>Theuma</i>	<i>ababensis</i>	d. Bounding	ii. Arid area specialist	04. Common Resident
Chelicerata	Araneae	Prodidomidae	<i>Theuma</i>	<i>fusca</i>	d. Bounding	ii. Arid area specialist	04. Common Resident

Class	Order	Family	Genus	Species	NSS Biogeography	NSS Ecological range	NSS Status
Chelicerata	Araneae	Salticidae	<i>Heliophanes</i>	<i>trepidus</i>	d. Bounding	iv. Generalist	04. Common Resident
Chelicerata	Araneae	Scytodidae	<i>Scytodes</i>	<i>arenacea</i>	d. Bounding	ii. Arid area specialist	04. Common Resident
Chelicerata	Araneae	Sicariidae	<i>Loxosceles</i>	<i>pilosa</i>	d. Bounding	iv. Generalist	04. Common Resident
Chelicerata	Araneae	Sicariidae	<i>Sicarius</i>	<i>albospinosus</i>	d. Bounding	iii. Habitat specialist	04. Common Resident
Chelicerata	Araneae	Sparassidae	<i>Carparachne</i>	<i>alba</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Chelicerata	Araneae	Sparassidae	<i>Carparachne</i>	<i>aureoflava</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Chelicerata	Araneae	Sparassidae	<i>Leucorchestris</i>	<i>arenicola</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Chelicerata	Araneae	Sparassidae	<i>Leucorchestris</i>	<i>sabulosa</i>	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic
Chelicerata	Araneae	Sparassidae	<i>Microrchestris</i>	<i>scutatus</i>	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic
Chelicerata	Araneae	Sparassidae	<i>Microrchestris</i>	<i>melanogaster</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Chelicerata	Araneae	Sparassidae	<i>Olios</i>	<i>correvoni</i>	d. Bounding	iv. Generalist	04. Common Resident
Chelicerata	Araneae	Sparassidae	<i>Orchestrella</i>	<i>browni</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Chelicerata	Araneae	Sparassidae	<i>Orchestrella</i>	<i>caroli</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Chelicerata	Araneae	Sparassidae	<i>Orchestrella</i>	<i>longipes</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Chelicerata	Araneae	Tetragnathidae	<i>Tetragnatha</i>	<i>andonea</i>	e. Sandwich	iii. Habitat specialist	04. Common Resident
Chelicerata	Araneae	Theridiidae	<i>Latrodectus</i>	<i>indistinctus</i>	d. Bounding	iv. Generalist	04. Common Resident
Chelicerata	Araneae	Theridiidae	<i>Latrodectus</i>	<i>renivulvatus</i>	d. Bounding	iii. Habitat specialist	02. Dune Endemic
Chelicerata	Araneae	Theridiidae	<i>Latrodectus</i>	<i>geometricus</i>	d. Bounding	iv. Generalist	12. Alien
Chelicerata	Araneae	Theridiidae	<i>Latrodectus</i>	<i>cinctus</i>	d. Bounding	iv. Generalist	04. Common Resident
Chelicerata	Araneae	Theridiidae	<i>Steatoda</i>	<i>capensis</i>	d. Bounding	ii. Arid area specialist	04. Common Resident
Chelicerata	Araneae	Thomisidae	<i>Thomisus</i>	<i>schultzei</i>	d. Bounding	iv. Generalist	04. Common Resident
Chelicerata	Araneae	Uloboridae	<i>Uloborus</i>	<i>plumipes</i>	d. Bounding	iv. Generalist	12. Alien
Chelicerata	Araneae	Zodariidae	<i>Capheris</i>	<i>haematilis</i>	d. Bounding	iv. Generalist	08. Marginal presence
Chelicerata	Araneae	Zodariidae	<i>Cydrela</i>	<i>approximata</i>	d. Bounding	iv. Generalist	08. Marginal presence
Chelicerata	Araneae	Zodariidae	<i>Cyrioctea</i>	<i>namibensis</i>	d. Bounding	ii. Arid area specialist	08. Marginal presence
Chelicerata	Araneae	Zodariidae	<i>Diores</i>	<i>namibia</i>	d. Bounding	ii. Arid area specialist	08. Marginal presence
Chelicerata	Araneae	Zodariidae	<i>Heradida</i>	<i>griffinae</i>	d. Bounding	ii. Arid area specialist	04. Common Resident
Chelicerata	Araneae	Zodariidae	<i>Palfuria</i>	<i>panner</i>	d. Bounding	ii. Arid area specialist	04. Common Resident
Chelicerata	Araneae	Zodariidae	<i>Diores</i>	<i>triangulifer</i>	d. Bounding	iv. Generalist	04. Common Resident
Chelicerata	Araneae	Zodariidae	<i>Psammoduon</i>	<i>deserticola</i>	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic
Chelicerata	Parasitiformes	Argasidae	<i>Ornithodoros</i>	<i>savignyi</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Chelicerata	Parasitiformes	Ixodidae	<i>Hyalomma</i>	<i>marginatum</i>	d. Bounding	iv. Generalist	04. Common Resident
Chelicerata	Parasitiformes	Ixodidae	<i>Rhipicephalus</i>	<i>gertrudae</i>	d. Bounding	iv. Generalist	04. Common Resident
Chelicerata	Pseudoscorpiones	Garypidae	<i>Ammogarypus</i>	<i>kalaharicus</i>			

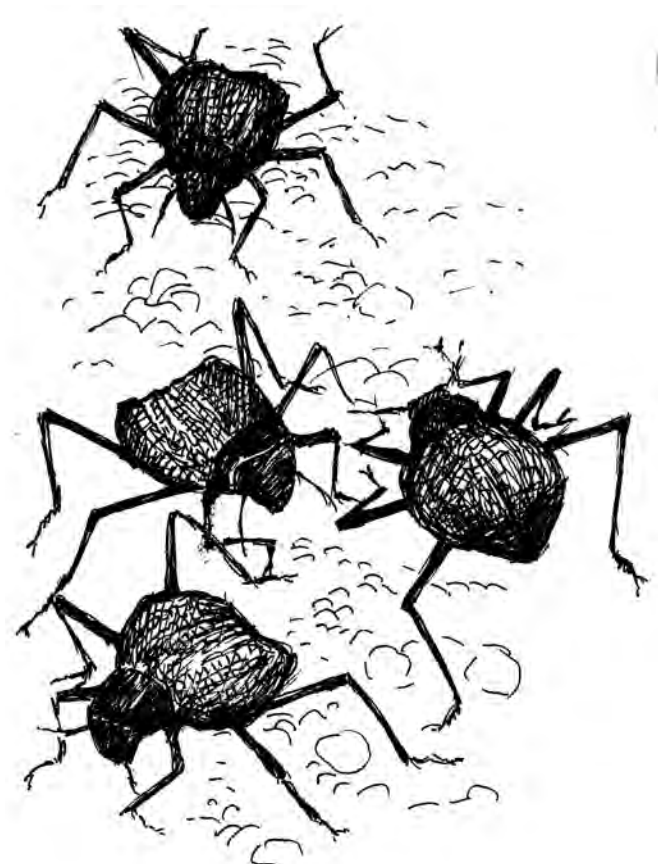
Class	Order	Family	Genus	Species	NSS Biogeography	NSS Ecological range	NSS Status
Chelicerata	Pseudoscorpiones	Garypidae	<i>Ammogarypus</i>	<i>lawrencei</i>			
Chelicerata	Pseudoscorpiones	Garypidae	<i>Ammogarypus</i>	<i>minor</i>			
Chelicerata	Pseudoscorpiones	Garypidae	<i>Eremogarypus</i>	<i>eximius</i>			
Chelicerata	Pseudoscorpiones	Garypidae	<i>Eremogarypus</i>	<i>perfectus</i>			
Chelicerata	Pseudoscorpiones	Garypidae	<i>Meiogarypus</i>	<i>mirus</i>			
Chelicerata	Pseudoscorpiones	Hesperolpiidae	<i>Ectactolpium</i>	<i>astatum</i>			
Chelicerata	Pseudoscorpiones	Hesperolpiidae	<i>Ectactolpium</i>	<i>eximium</i>			
Chelicerata	Pseudoscorpiones	Olpiidae	<i>Pseudohorus</i>	<i>excavatus</i>			
Chelicerata	Pseudoscorpiones	Olpiidae	<i>Pseudohorus</i>	<i>gracilis</i>			
Chelicerata	Pseudoscorpiones	Olpiidae	<i>Pseudohorus</i>	<i>molliventer</i>			
Chelicerata	Pseudoscorpiones	Olpiidae	<i>Pseudohorus</i>	<i>strumosus</i>			
Chelicerata	Scorpiones	Buthidae	<i>Hottentota</i>	<i>conspersus</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Chelicerata	Scorpiones	Buthidae	<i>Hottentota</i>	<i>arenaceus</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Chelicerata	Scorpiones	Buthidae	<i>Karasbergia</i>	<i>muthueni</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Chelicerata	Scorpiones	Buthidae	<i>Parabuthus</i>	<i>brevimanus</i>	c. Widespread	ii. Arid area specialist	04. Common Resident
Chelicerata	Scorpiones	Buthidae	<i>Parabuthus</i>	<i>schlechteri</i>	d. Bounding	iii. Habitat specialist	08. Marginal presence
Chelicerata	Scorpiones	Buthidae	<i>Parabuthus</i>	<i>granulatus</i>	c. Widespread	ii. Arid area specialist	04. Common Resident
Chelicerata	Scorpiones	Buthidae	<i>Parabuthus</i>	<i>laevifrons</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Chelicerata	Scorpiones	Buthidae	<i>Parabuthus</i>	<i>namibensis</i>	a. Sand Sea	iii. Habitat specialist	03. Near Endemic
Chelicerata	Scorpiones	Buthidae	<i>Parabuthus</i>	<i>stridulus</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Chelicerata	Scorpiones	Buthidae	<i>Parabuthus</i>	<i>villosus</i>	d. Bounding	iii. Habitat specialist	04. Common Resident
Chelicerata	Scorpiones	Buthidae	<i>Uroplectes</i>	<i>otjimbinguensis</i>	d. Bounding	iii. Habitat specialist	03. Near Endemic
Chelicerata	Scorpiones	Buthidae	<i>Uroplectes</i>	<i>planimanus</i>	d. Bounding	iii. Habitat specialist	04. Common Resident
Chelicerata	Scorpiones	Buthidae	<i>Uroplectes</i>	<i>carinatus</i>	d. Bounding	ii. Arid area specialist	04. Common Resident
Chelicerata	Scorpiones	Scorpionidae	<i>Opisthophthalmus</i>	<i>flavescens</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Chelicerata	Scorpiones	Scorpionidae	<i>Opisthophthalmus</i>	<i>holmi</i>	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic
Chelicerata	Scorpiones	Scorpionidae	<i>Opisthophthalmus</i>	<i>carinatus</i>	d. Bounding	ii. Arid area specialist	04. Common Resident
Chelicerata	Scorpiones	Scorpionidae	<i>Opisthophthalmus</i>	<i>wahlbergi</i>	c. Widespread	ii. Arid area specialist	04. Common Resident
Chelicerata	Scorpiones	Scorpionidae	<i>Opisthophthalmus</i>	<i>opinatus</i>	d. Bounding	ii. Arid area specialist	04. Common Resident
Chelicerata	Scorpiones	Scorpionidae	<i>Hadogenes</i>	<i>tityrus</i>	b. Inselbergs	iii. Habitat specialist	06. Relict
Chelicerata	Scorpiones	Scorpionidae	<i>Hadogenes</i>	<i>lawrencei</i>	b. Inselbergs	iii. Habitat specialist	06. Relict
Chelicerata	Solifugae	Ceromidae	<i>Ceroma</i>	<i>inerme</i>	d. Bounding	iii. Habitat specialist	02. Dune Endemic
Chelicerata	Solifugae	Daesiidae	<i>Biton</i>	<i>adamanteus</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Chelicerata	Solifugae	Daesiidae	<i>Biton</i>	<i>striatus</i>	d. Bounding	ii. Arid area specialist	04. Common Resident

Class	Order	Family	Genus	Species	NSS Biogeography	NSS Ecological range	NSS Status
Chelicerata	Solifugae	Daesiidae	<i>Biton</i>	<i>hottentotta</i>	d. Bounding	ii. Arid area specialist	04. Common Resident
Chelicerata	Solifugae	Daesiidae	<i>Biton</i>	<i>namaqua</i>	d. Bounding	ii. Arid area specialist	04. Common Resident
Chelicerata	Solifugae	Daesiidae	<i>Blossia</i>	<i>falcifera namibensis</i>	a. Sand Sea	ii. Arid area specialist	01. Strict Endemic
Chelicerata	Solifugae	Daesiidae	<i>Blossia</i>	<i>planicursor</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Chelicerata	Solifugae	Daesiidae	<i>Blossia</i>	<i>purpurea</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Chelicerata	Solifugae	Daesiidae	<i>Blossia</i>	<i>rooica</i>	a. Sand Sea	ii. Arid area specialist	01. Strict Endemic
Chelicerata	Solifugae	Daesiidae	<i>Blossia</i>	<i>sabulosa</i>	a. Sand Sea	ii. Arid area specialist	01. Strict Endemic
Chelicerata	Solifugae	Daesiidae	<i>Eberlanzia</i>	<i>flava trilineata</i>	a. Sand Sea	ii. Arid area specialist	01. Strict Endemic
Chelicerata	Solifugae	Daesiidae	<i>Hemiblossia</i>	<i>robusta</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Chelicerata	Solifugae	Daesiidae	<i>Namibesia</i>	<i>pallida</i>	a. Sand Sea	ii. Arid area specialist	01. Strict Endemic
Chelicerata	Solifugae	Gylippidae	<i>Trichotoma</i>	<i>michaelseni</i>	d. Bounding	ii. Arid area specialist	05. Rare Resident
Chelicerata	Solifugae	Hexisopodidae	<i>Hexisopus</i>	<i>infuscatus</i>	a. Sand Sea	iii. Habitat specialist	02. Dune Endemic
Chelicerata	Solifugae	Hexisopodidae	<i>Hexisopus</i>	<i>nigroplagiatus</i>	a. Sand Sea	iii. Habitat specialist	01. Strict Endemic
Chelicerata	Solifugae	Hexisopodidae	<i>Hexisopus</i>	<i>psammophilus</i>	a. Sand Sea	iii. Habitat specialist	01. Strict Endemic
Chelicerata	Solifugae	Hexisopodidae	<i>Hexisopus</i>	<i>pusillus</i>	a. Sand Sea	iii. Habitat specialist	03. Near Endemic
Chelicerata	Solifugae	Hexisopodidae	<i>Mossamedessa</i>	<i>eberlanzi</i>	a. Sand Sea	iii. Habitat specialist	01. Strict Endemic
Chelicerata	Solifugae	Hexisopodidae	<i>Siloana</i>	<i>eberlanzi</i>	a. Sand Sea	iii. Habitat specialist	01. Strict Endemic
Chelicerata	Solifugae	Karschiidae	<i>Lipophaga</i>	<i>michaelseni</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Chelicerata	Solifugae	Melanoblossidae	<i>Lawrencega</i>	<i>longitarsis</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Chelicerata	Solifugae	Melanoblossidae	<i>Lawrencega</i>	<i>minuta</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Chelicerata	Solifugae	Melanoblossidae	<i>Lawrencega</i>	<i>solaris</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Chelicerata	Solifugae	Melanoblossidae	<i>Unguiblossia</i>	<i>cauduliger</i>	c. Widespread	ii. Arid area specialist	04. Common Resident
Chelicerata	Solifugae	Melanoblossidae	<i>Unguiblossia</i>	<i>eberlanzi</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Chelicerata	Solifugae	Melanoblossidae	<i>Microblossia</i>	<i>eberlanzi</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Chelicerata	Solifugae	Solpugidae	<i>Solpuga</i>	<i>venator</i>	c. Widespread	ii. Arid area specialist	04. Common Resident
Chelicerata	Solifugae	Solpugidae	<i>Solpuga</i>	<i>lateralis</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Chelicerata	Solifugae	Solpugidae	<i>Solpuga</i>	<i>monteiroi</i>	d. Bounding	ii. Arid area specialist	04. Common Resident
Chelicerata	Solifugae	Solpugidae	<i>Metasolpuga</i>	<i>picta</i>	d. Bounding	ii. Arid area specialist	04. Common Resident
Chelicerata	Solifugae	Solpugidae	<i>Prosolpuga</i>	<i>schultzei</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Chelicerata	Solifugae	Solpugidae	<i>Solpugema</i>	<i>genucornis</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Chelicerata	Solifugae	Solpugidae	<i>Solpugiba</i>	<i>lineata</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Chelicerata	Solifugae	Solpugidae	<i>Solpugiba</i>	<i>brevipalpis</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Chelicerata	Solifugae	Solpugidae	<i>Solpugista</i>	<i>bicolor</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Chelicerata	Solifugae	Solpugidae	<i>Solpugista</i>	<i>hastata</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident

Class	Order	Family	Genus	Species	NSS Biogeography	NSS Ecological range	NSS Status
Chelicerata	Solifugae	Solpugidae	<i>Zeria</i>	<i>lawrencei</i>	d. Bounding	ii. Arid area specialist	04. Common Resident
Chelicerata	Solifugae	Solpugidae	<i>Zeria</i>	<i>recta</i>	d. Bounding	ii. Arid area specialist	04. Common Resident
Chelicerata	Solifugae	Solpugidae	<i>Zeria</i>	<i>umbonata</i>	d. Bounding	ii. Arid area specialist	04. Common Resident
Chilopoda	Geophilida	Oryidae	<i>Aspidopleres</i>	<i>intercalatus</i>	d. Bounding	iii. Habitat specialist	04. Common Resident
Chilopoda	Geophilida	Oryidae	<i>Diphtherogaster</i>	<i>flavus</i>	d. Bounding	iii. Habitat specialist	04. Common Resident
Chilopoda	Scolopendrida	Scolopendridae	<i>Cormocephalus</i>	<i>deventeri</i>	d. Bounding	iv. Generalist	04. Common Resident
Chilopoda	Scolopendrida	Scolopendridae	<i>Trachycormocephalus</i>	<i>occidentalis</i>	d. Bounding	iv. Generalist	04. Common Resident
Chilopoda	Scolopendrida	Scolopendridae	<i>Scolopendra</i>	<i>morsitans</i>	d. Bounding	iv. Generalist	04. Common Resident
Diplopoda	Polydesmida	Paradoxosomatidae	<i>Cnemodesmus</i>	<i>riparius</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident

Annex 13

Table of Insects



Namib Sand Sea Biogeography Biogeography description

- a. Sand Sea Sand Sea inhabitants rarely ranging outside dune habitats
- b. Inselbergs Petrophilous inselberg inhabitants occurring as isolated populations within the Sand Sea
- c. Widespread May inhabit any part of the property due to vagility and catholic ecological choice
- d. Boundinging Mostly found adjacent to the Sand Sea and contributing to biodiversity and ecology through suitable habitat inside the property, marginally intruding or absent from dunes
- e. Sandwich Ramsar Specific Sandwich Harbour Ramsar site inhabitants

Ecological range

- i. Dune Sea specialist
- ii. Arid area specialist
- iii. Habitat specialist
- iv. Generalist

Ecological range description

- Psammophilous species restricted to Namib Biome sand dunes
- Euryaceous species restricted to arid biome habitats
- Stenotypic species, habitat, host or prey specific
- Not habitat specific with wide ecological choice

Status

- 01. Strict Endemic
- 02. Dune Endemic
- 03. Near Endemic
- 04. Common Resident
- 05. Rare Resident
- 06. Relict
- 07. Interdigitated resident
- 08. Marginal presence
- 09. Common migrant
- 10. Intermittent visitor
- 11. Vagrant
- 12. Alien
- 13. Domesticated

Status Description

- Psammophilous species only found in Namib Sand Sea
- Psammophilous species in Namib Sand Sea, range extend to outhur Namib Biome dune areas
- Restricted to Namib Biomes
- Common throughout Namib Sand Sea property
- Rarely recorded from Namib Sand Sea property, not unexpected
- Isolated healthy populations in Namib Sand Sea far from core species range
- Readily found inside the property at suitable habitat intruding into the Sand Sea
- Incidental presence within the property from range overspill
- Present whenever conditions are suitable
- Rarely occur only when conditions are suitable
- Unusual and isolated records
- Feral populations of extralimital species
- Introduced alien species that is managed, occasionally vagrant

Class	Order	Family	Genus	Species	NSS Biogeography	NSS Ecological range	NSS Status
Kingdom: Animalia			Phylum: Arthropoda				
Insecta	Coleoptera	Curculionidae	<i>Hyomora</i>	<i>falcipes</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Curculionidae	<i>Hyomora</i>	<i>subvirens</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Curculionidae	<i>Leptostethus</i>	<i>aureus</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Curculionidae	<i>Leptostethus</i>	<i>fallax</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Curculionidae	<i>Leptostethus</i>	<i>speciosus</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Curculionidae	<i>Leptostethus</i>	<i>sublineatus</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Curculionidae	<i>Leptostethus</i>	<i>uniformis</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Curculionidae	<i>Leptostethus</i>	<i>varius</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Curculionidae	<i>Leptostethus</i>	<i>waltoni</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Geotrupidae	<i>Namibiotrupes</i>	<i>penrithae</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Glaresidae	<i>Glaresis</i>	<i>namibensis</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Histeridae	<i>Tribalus</i>	<i>namibiensis</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Meloidae	<i>Paractenodia</i>	<i>freyi</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Ochodaeidae	<i>Namibiotalpa</i>	<i>fossilis</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Ochodaeidae	<i>Synochodaeus</i>	<i>cucullus</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Scarabaeidae	<i>Hammondantus</i>	<i>psammophilus</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Scarabaeidae	<i>Namakwanus</i>	<i>irishi</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Scarabaeidae	<i>Psammmodaphodius</i>	<i>kochi</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Scarabaeidae	<i>Scarabaeus</i>	<i>denticollis</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Scarabaeidae	<i>Scarabaeus</i>	<i>fitzimonsi</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Scarabaeidae	<i>Scarabaeus</i>	<i>rodriguesi</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Scarabaeidae	<i>Scarabaeus</i>	<i>rotundigena</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Archinamibia</i>	<i>peezi</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Argenticrinis</i>	<i>lossowi</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Caenocrypticus</i>	<i>delabati</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Caenocrypticus</i>	<i>kochi</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Caenocrypticus</i>	<i>noctivagus</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Caenocrypticus</i>	<i>pauliani</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Caenocrypticus</i>	<i>peezi</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Caenocrypticus</i>	<i>penrithae</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Lepidochora</i>	<i>sp. nov. (undescribed)</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Namibomodes</i>	<i>maculicollis</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Namibomodes</i>	<i>zarcoi</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Onymacris</i>	<i>laeviceps</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Onymacris</i>	<i>rugatipennis</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Onymacris</i>	<i>unguicularis</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic

Class	Order	Family	Genus	Species	NSS Biogeography	NSS Ecological range	NSS Status
Insecta	Coleoptera	Tenebrionidae	<i>Oxura</i>	<i>rufotibiata planipennata</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Pachynotelus</i>	<i>albonotatus</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Pachynotelus</i>	<i>kuehnelti</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Psammogaster</i>	<i>malani</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Pterostichula</i>	<i>aridipaludis</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Uniungulum</i>	<i>hoeschi</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Vansonium</i>	<i>bushmanicum namibense</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>caecus</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>damarensis</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>eremita</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>fairmairei fairmairei</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>fairmairei luederitzensis</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>hamiltonuli</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>hereroensis</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>moralesi</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>sexfrenorum</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Neuroptera	Myrmeleontidae	<i>Pamares</i>	<i>deru</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Orthoptera	Acrididae	<i>Brainia</i>	<i>hirsuta</i>	a. Sand Sea	ii. Arid area specialist	01. Strict Endemic
Insecta	Orthoptera	Bradyporidae	<i>Acanthoproctus</i>	<i>diadematus</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Orthoptera	Schizodactylidae	<i>Comicus</i>	<i>carnalli</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Thysanura	Lepismatidae	<i>Ctenolepisma</i>	<i>detritus</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Thysanura	Lepismatidae	<i>Ctenolepisma</i>	<i>spinipes</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Thysanura	Lepismatidae	<i>Mormisma</i>	<i>wygodzinskyi</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Thysanura	Lepismatidae	<i>Namibmormisma</i>	<i>muricaudata</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Thysanura	Lepismatidae	<i>Namibmormisma</i>	<i>setosa</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Thysanura	Lepismatidae	<i>Nebkhalepisma</i>	<i>australis</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Thysanura	Lepismatidae	<i>Ornatilepisma</i>	<i>horni</i>	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Insecta	Coleoptera	Meloidae	<i>Iselma</i>	<i>deserticola</i>	b. Inselbergs	ii. Arid area specialist	01. Strict Endemic
Insecta	Coleoptera	Buprestidae	<i>Julodis</i>	<i>mitifica</i>	a. Sand Sea	iii. Habitat specialist	02. Dune Endemic
Insecta	Coleoptera	Curculionidae	<i>Hyomora</i>	<i>manca</i>	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic
Insecta	Coleoptera	Glaresidae	<i>Glaresis</i>	<i>koenigsbaueri</i>	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic
Insecta	Coleoptera	Scarabaeidae	<i>Scarabaeus</i>	<i>bennigseni</i>	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic
Insecta	Coleoptera	Scarabaeidae	<i>Scarabaeus</i>	<i>rubripennis</i>	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic
Insecta	Coleoptera	Scarabaeidae	<i>Sparrmannia</i>	<i>boschimana</i>	a. Sand Sea	ii. Arid area specialist	02. Dune Endemic
Insecta	Coleoptera	Scarabaeidae	<i>Sparrmannia</i>	<i>similis</i>	a. Sand Sea	ii. Arid area specialist	02. Dune Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Arthrochora</i>	<i>arenicola</i>	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Brinckia</i>	<i>debilis</i>	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic

Class	Order	Family	Genus	Species	NSS Biogeography	NSS Ecological range	NSS Status
Insecta	Coleoptera	Tenebrionidae	<i>Brinckia</i>	<i>insularis</i>	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Brinckia</i>	<i>vaga</i>	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Caenocrypticus</i>	<i>ephialtes</i>	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Caenocrypticus</i>	<i>phaleroides</i>	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Calognathus</i>	<i>chevrolati</i>	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Cauricara</i>	<i>brunnipes</i>	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Fossilochile</i>	<i>rufa</i>	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Lepidochora</i>	<i>discoidalis</i>	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Lepidochora</i>	<i>kahani</i>	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Lepidochora</i>	<i>porti</i>	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Leubbertia</i>	<i>plana</i>	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Onymacris</i>	<i>boschimana</i>	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Onymacris</i>	<i>plana</i>	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Oppenheimeria</i>	<i>bombophthalma</i>	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Pterostichula</i>	<i>fontanalis</i>	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Sulcipectus</i>	<i>levis</i>	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>gracilipes</i>	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>orbicularis</i>	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>prona</i>	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic
Insecta	Hymenoptera	Bradynobaenidae	<i>Apterogyna</i>	<i>schultzei</i>	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic
Insecta	Hymenoptera	Colletidae	<i>Colletes</i>	<i>schultzei</i>	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic
Insecta	Hymenoptera	Formicidae	<i>Camponotus</i>	<i>detritus</i>	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic
Insecta	Hymenoptera	Sphecidae	<i>Gastrosericus</i>	<i>mirabilis</i>	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic
Insecta	Hymenoptera	Sphecidae	<i>Miscophus</i>	<i>deserticolus</i>	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic
Insecta	Orthoptera	Schizodactylidae	<i>Comicus</i>	<i>calcaris</i>	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic
Insecta	Thysanura	Lepismatidae	<i>Ctenolepisma</i>	<i>arenicola</i>	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic
Insecta	Thysanura	Lepismatidae	<i>Ctenolepisma</i>	<i>pauliani</i>	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic
Insecta	Thysanura	Lepismatidae	<i>Gopsilepisma</i>	<i>verecunda</i>	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic
Insecta	Thysanura	Lepismatidae	<i>Sabulepisma</i>	<i>multiformis</i>	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic
Insecta	Thysanura	Lepismatidae	<i>Swalepisma</i>	<i>mirabilis</i>	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic
Insecta	Coleoptera	Scarabaeidae	<i>Scarabaeus</i>	<i>vansoni</i>	a. Sand Sea	ii. Arid area specialist	03. Near Endemic
Insecta	Orthoptera	Schizodactylidae	<i>Comicus</i>	<i>arenarius</i>	a. Sand Sea	i. Dune Sea specialist	03. Near Endemic
Insecta	Thysanura	Lepismatidae	<i>Monachina</i>	<i>stilifera</i>	a. Sand Sea	i. Dune Sea specialist	03. Near Endemic
Insecta	Coleoptera	Chrysomelidae	<i>Monolepta</i>	<i>desertorum</i>	c. Widespread	iii. Habitat specialist	03. Near Endemic
Insecta	Coleoptera	Coccinellidae	<i>Pharoscymnus</i>	<i>kuisebensis</i>	c. Widespread	iii. Habitat specialist	03. Near Endemic
Insecta	Coleoptera	Geotrupidae	<i>Prototrupes</i>	<i>kochi</i>	c. Widespread	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Glareidae	<i>Glareis</i>	<i>holmi</i>	c. Widespread	iii. Habitat specialist	03. Near Endemic

Class	Order	Family	Genus	Species	NSS Biogeography	NSS Ecological range	NSS Status
Insecta	Coleoptera	Histeridae	<i>Pholioxenus</i>	<i>endroedyi</i>	c. Widespread	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Histeridae	<i>Tribalus</i>	<i>kochi</i>	c. Widespread	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Malachiidae	<i>Attalus</i>	<i>kochi</i>	c. Widespread	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Malachiidae	<i>Dinometopus</i>	<i>narebisanus</i>	c. Widespread	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Malachiidae	<i>Metaphilhedonus</i>	<i>penrithae</i>	c. Widespread	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Meloidae	<i>Actenodia</i>	<i>mirabilis</i>	c. Widespread	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Meloidae	<i>Australytta</i>	<i>szekessyi</i>	c. Widespread	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Meloidae	<i>Hycleus</i>	<i>brincki</i>	c. Widespread	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Meloidae	<i>Hycleus</i>	<i>deserticolus</i>	c. Widespread	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Meloidae	<i>Hycleus</i>	<i>svakopinus</i>	c. Widespread	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Meloidae	<i>Hycleus</i>	<i>tinctus</i>	c. Widespread	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Meloidae	<i>Lydomorphus</i>	<i>karibibensis</i>	c. Widespread	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Meloidae	<i>Prolytta</i>	<i>namibensis</i>	c. Widespread	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Melyridae	<i>Attalus</i>	<i>oberprieleri</i>	c. Widespread	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Melyridae	<i>Dinometopus</i>	<i>narebisanus</i>	c. Widespread	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Melyridae	<i>Metaphilhedonus</i>	<i>swakopmundensis</i>	c. Widespread	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Melyridae	<i>Penhedybius</i>	<i>namibicus</i>	c. Widespread	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Melyridae	<i>Urodactylus</i>	<i>kuisepensis</i>	c. Widespread	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Ochodaeidae	<i>Synochodaeus</i>	<i>costatus</i>	c. Widespread	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Scarabaeidae	<i>Aphodius</i>	<i>ganabi</i>	c. Widespread	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Scarabaeidae	<i>Aphodius</i>	<i>gobabensis</i>	c. Widespread	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Scarabaeidae	<i>Aphodius</i>	<i>psammophilus</i>	c. Widespread	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Scarabaeidae	<i>Aphodius</i>	<i>wardi</i>	c. Widespread	ii. Arid area specialist	03. Near Endemic
Insecta	Diptera	Asilidae	<i>Laphystia</i>	<i>kochi</i>	c. Widespread	ii. Arid area specialist	03. Near Endemic
Insecta	Diptera	Calliphoridae	<i>Isomyia</i>	<i>deserti</i>	c. Widespread	ii. Arid area specialist	03. Near Endemic
Insecta	Neuroptera	Myrmeleontidae	<i>Golafrus</i>	<i>oneili</i>	c. Widespread	ii. Arid area specialist	03. Near Endemic
Insecta	Neuroptera	Myrmeleontidae	<i>Pamares</i>	<i>damarus</i>	c. Widespread	ii. Arid area specialist	03. Near Endemic
Insecta	Orthoptera	Acrididae	<i>Acocksacris</i>	<i>carpi</i>	c. Widespread	ii. Arid area specialist	03. Near Endemic
Insecta	Orthoptera	Acrididae	<i>Acocksacris</i>	<i>namibensis</i>	c. Widespread	ii. Arid area specialist	03. Near Endemic
Insecta	Thysanura	Lepismatidae	<i>Thermobia</i>	<i>nebulosa</i>	c. Widespread	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Carabidae	<i>Graphipterus</i>	<i>kochi</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Cerambycidae	<i>Chemsakiellus</i>	<i>taurus</i>	d. Bounding	iii. Habitat specialist	03. Near Endemic
Insecta	Coleoptera	Cerambycidae	<i>Cornuchariesthes</i>	<i>albomaculata</i>	d. Bounding	iii. Habitat specialist	03. Near Endemic
Insecta	Coleoptera	Cerambycidae	<i>Ontochariesthes</i>	<i>erongoensis</i>	d. Bounding	iii. Habitat specialist	03. Near Endemic
Insecta	Coleoptera	Curculionidae	<i>Leptostethus</i>	<i>marginatus</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Curculionidae	<i>Leptostethus</i>	<i>scitulus</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Drilidae	<i>Selasia</i>	<i>oberprieleri</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic

Class	Order	Family	Genus	Species	NSS Biogeography	NSS Ecological range	NSS Status
Insecta	Coleoptera	Dytiscidae	<i>Hydrovatus</i>	<i>deserticola</i>	d. Bounding	iii. Habitat specialist	03. Near Endemic
Insecta	Coleoptera	Meloidae	<i>Hycleus</i>	<i>kochi</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Meloidae	<i>Iselma</i>	<i>penrithae</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Meloidae	<i>Namibiella</i>	<i>elegantula</i>	d. Bounding	iv. Generalist	03. Near Endemic
Insecta	Coleoptera	Meloidae	<i>Nemognatha</i>	<i>vansoni</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Melyridae	<i>Colotrema</i>	<i>kuisebensis</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Melyridae	<i>Mixis</i>	<i>kuisepensis</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Oedemeridae	<i>Probosca</i>	<i>maraisi</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Scarabaeidae	<i>Anoplocheilus</i>	<i>namibicus</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Scarabaeidae	<i>Chasme</i>	<i>kochi</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Scarabaeidae	<i>Leucocelis</i>	<i>franki</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Scarabaeidae	<i>Pachnoda</i>	<i>picturata</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Scarabaeidae	<i>Psammadius</i>	<i>substriatus</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Scarabaeidae	<i>Rhabdotis</i>	<i>albonotata</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Staphylinidae	<i>Cordalia</i>	<i>namibicola</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Cauricara</i>	<i>phalangium rufofemorata</i>	d. Bounding	iv. Generalist	03. Near Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Ennychiatus</i>	<i>fitzsimonsi</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Epiphysa</i>	<i>arenicola</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Fitzsimonsium</i>	<i>cymbium</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Horatoma</i>	<i>deserticola</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Horatoma</i>	<i>pronamibensis</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Horatoma</i>	<i>rupicola</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Horatoma</i>	<i>scherzi</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Metriopus</i>	<i>depressus</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Pachynotelus</i>	<i>albostriatus</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Pachynotelus</i>	<i>comma</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Pachynotelus</i>	<i>granaticollis</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Pachynotelus</i>	<i>machadoi</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Pachynotelus</i>	<i>rufus</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Pachynotelus</i>	<i>streyi</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Pachynotelus</i>	<i>strigicollis</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Planostibes</i>	<i>dentipes</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Tenebrionidae	<i>Synhimba</i>	<i>melancholicum</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Thorictidae	<i>Thorictus</i>	<i>namibensis</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Diptera	Acroceridae	<i>Astomella</i>	<i>deserticola</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Diptera	Mydidae	<i>Eremohaplomydas</i>	<i>desertorum</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Diptera	Mydidae	<i>Namadytes</i>	<i>prozeskyi</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic

Class	Order	Family	Genus	Species	NSS Biogeography	NSS Ecological range	NSS Status
Insecta	Diptera	Mydidae	<i>Parectyphus</i>	<i>namibiensis</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Diptera	Scenopinidae	<i>Propebrevitrichia</i>	<i>falcata</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Diptera	Scenopinidae	<i>Propebrevitrichia</i>	<i>gobabebensis</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Diptera	Scenopinidae	<i>Scenopinus</i>	<i>namibensis</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Diptera	Therevidae	<i>Orthactia</i>	<i>deserticola</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Diptera	Therevidae	<i>Orthactia</i>	<i>gobabebensis</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Diptera	Trioxscelididae	<i>Trioxscelis</i>	<i>namibensis</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Diptera	Ulidiidae	<i>Namibotites</i>	<i>argentata</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Diptera	Vermileonidae	<i>Lampromyia</i>	<i>sericea</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Hymenoptera	Chrysididae	<i>Elampus</i>	<i>namibiensis</i>	d. Bounding	iv. Generalist	03. Near Endemic
Insecta	Hymenoptera	Chrysididae	<i>Hedychridium</i>	<i>desertorum</i>	d. Bounding	iv. Generalist	03. Near Endemic
Insecta	Hymenoptera	Chrysididae	<i>Hedychridium</i>	<i>namibianum</i>	d. Bounding	iv. Generalist	03. Near Endemic
Insecta	Hymenoptera	Colletidae	<i>Colletes</i>	<i>capensis</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Hymenoptera	Colletidae	<i>Colletes</i>	<i>namibicus</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Hymenoptera	Encyrtidae	<i>Cheiloneurus</i>	<i>kuisebi</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Hymenoptera	Encyrtidae	<i>Mayridia</i>	<i>maryae</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Hymenoptera	Encyrtidae	<i>Paranusia</i>	<i>arenaria</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Hymenoptera	Formicidae	<i>Monomorium</i>	<i>damarense</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Hymenoptera	Formicidae	<i>Monomorium</i>	<i>marshi</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Hymenoptera	Formicidae	<i>Monomorium</i>	<i>robustior</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Hymenoptera	Formicidae	<i>Ocymyrmex</i>	<i>robustior</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Hymenoptera	Formicidae	<i>Ocymyrmex</i>	<i>turneri</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Hymenoptera	Formicidae	<i>Tetramorium</i>	<i>jordani</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Hymenoptera	Formicidae	<i>Triglyphothrix</i>	<i>desertorum</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Hymenoptera	Halictidae	<i>Halictus</i>	<i>arenicola</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Hymenoptera	Halictidae	<i>Nomioides</i>	<i>luderitzi</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Hymenoptera	Masaridae	<i>Priscomasaris</i>	<i>namibiensis</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Hymenoptera	Mutillidae	<i>Dasylabris</i>	<i>schultzei</i>	d. Bounding	iv. Generalist	03. Near Endemic
Insecta	Hymenoptera	Sphecidae	<i>Bembix</i>	<i>namibensis</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Hymenoptera	Sphecidae	<i>Gastrosericus</i>	<i>capensis</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Hymenoptera	Sphecidae	<i>Gastrosericus</i>	<i>herero</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Hymenoptera	Sphecidae	<i>Gastrosericus</i>	<i>turneri</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Hymenoptera	Sphecidae	<i>Miscophus</i>	<i>fluviatilis</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Hymenoptera	Sphecidae	<i>Miscophus</i>	<i>sabulosus</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Lepidoptera	Gelechiidae	<i>Metzneria</i>	<i>brandbergi</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Lepidoptera	Hesperiidae	<i>Sarangesa</i>	<i>gaerdesi</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Lepidoptera	Noctuidae	<i>Eublemma</i>	<i>deserti</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic

Class	Order	Family	Genus	Species	NSS Biogeography	NSS Ecological range	NSS Status
Insecta	Lepidoptera	Nymphalidae	<i>Acraea</i>	<i>hypoleuca</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Lepidoptera	Pieridae	<i>Colotis</i>	<i>doubledayi angolanus</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Lepidoptera	Saturniidae	<i>Heniocha</i>	<i>marnois</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Lepidoptera	Saturniidae	<i>Usta</i>	<i>wallengrenii</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Mantodea	Iridopterygidae	<i>Bolbena</i>	<i>maraisi</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Mantodea	Iridopterygidae	<i>Bolbena</i>	<i>minutissima</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Mantodea	Mantidae	<i>Ligaria</i>	<i>brevicollis</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Mantodea	Mantidae	<i>Ligariella</i>	<i>damarae</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Mantodea	Mantidae	<i>Tarachodes</i>	<i>namibiensis</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Neuroptera	Nemopteridae	<i>Laurhervasia</i>	<i>namibica</i>	d. Bounding	ii. Arid area specialist	03. Near Endemic
Insecta	Coleoptera	Ptinidae	<i>Damarus</i>	<i>magnus</i>	a. Sand Sea	iv. Generalist	04. Common Resident
Insecta	Coleoptera	Ptinidae	<i>Stethomezium</i>	<i>notiale</i>	a. Sand Sea	iv. Generalist	04. Common Resident
Insecta	Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>testudinaria</i>	a. Sand Sea	ii. Arid area specialist	04. Common Resident
Insecta	Heteroptera	Cydnidae	<i>Cydnus</i>	<i>hirsutus</i>	a. Sand Sea	iii. Habitat specialist	04. Common Resident
Insecta	Homoptera	Diaspididae	<i>Namibia</i>	<i>spinosa</i>	a. Sand Sea	iii. Habitat specialist	04. Common Resident
Insecta	Homoptera	Psyllidae	<i>Colposcencia</i>	<i>australis</i>	a. Sand Sea	iii. Habitat specialist	04. Common Resident
Insecta	Homoptera	Psyllidae	<i>Colposcencia</i>	<i>namibiensis</i>	a. Sand Sea	iii. Habitat specialist	04. Common Resident
Insecta	Isoptera	Rhinotermitidae	<i>Psammotermes</i>	<i>allocerus</i>	a. Sand Sea	i. Dune Sea specialist	04. Common Resident
Insecta	Orthoptera	Stenopelmatidae	<i>Maxentius</i>	<i>kuhlgatzi</i>	a. Sand Sea	i. Dune Sea specialist	04. Common Resident
Insecta	Orthoptera	Stenopelmatidae	<i>Maxentius</i>	<i>pinguis</i>	a. Sand Sea	i. Dune Sea specialist	04. Common Resident
Insecta	Blattodea	Blatellidae	<i>Namablatta</i>	<i>bitaeniata</i>	c. Widespread	ii. Arid area specialist	04. Common Resident
Insecta	Blattodea	Euthyrrhaphidae	<i>Tivia</i>	<i>simulatrix</i>	c. Widespread	ii. Arid area specialist	04. Common Resident
Insecta	Coleoptera	Anthicidae	<i>Anthicus</i>	<i>crinitus</i>	c. Widespread	iv. Generalist	04. Common Resident
Insecta	Coleoptera	Anthicidae	<i>Anthicus</i>	<i>techowi</i>	c. Widespread	iv. Generalist	04. Common Resident
Insecta	Coleoptera	Apionidae	<i>Corimalia</i>	<i>damarensis</i>	c. Widespread	iv. Generalist	04. Common Resident
Insecta	Coleoptera	Carabidae	<i>Crepidogaster</i>	<i>kochi</i>	c. Widespread	iv. Generalist	04. Common Resident
Insecta	Coleoptera	Cleridae	<i>Necrobia</i>	<i>rufipes</i>	c. Widespread	iii. Habitat specialist	04. Common Resident
Insecta	Coleoptera	Coccinellidae	<i>Cheilomenes</i>	<i>lunata</i>	c. Widespread	iv. Generalist	04. Common Resident
Insecta	Coleoptera	Coccinellidae	<i>Exochomus</i>	<i>flaviventris</i>	c. Widespread	iv. Generalist	04. Common Resident
Insecta	Coleoptera	Histeridae	<i>Hister</i>	<i>namas</i>	c. Widespread	ii. Arid area specialist	04. Common Resident
Insecta	Coleoptera	Histeridae	<i>Saprinus</i>	<i>cupreus</i>	c. Widespread	iv. Generalist	04. Common Resident
Insecta	Coleoptera	Meloidae	<i>Ceroctis</i>	<i>phalerata</i>	c. Widespread	iv. Generalist	04. Common Resident
Insecta	Coleoptera	Meloidae	<i>Hycleus</i>	<i>zigzagus</i>	c. Widespread	iv. Generalist	04. Common Resident
Insecta	Coleoptera	Meloidae	<i>Lydomorphus</i>	<i>thoracicus</i>	c. Widespread	iv. Generalist	04. Common Resident
Insecta	Coleoptera	Mordellidae	<i>Mordella</i>	<i>turneri</i>	c. Widespread	iv. Generalist	04. Common Resident
Insecta	Coleoptera	Nitidulidae	<i>Carpophilus</i>	<i>dimidiatus</i>	c. Widespread	iv. Generalist	04. Common Resident
Insecta	Coleoptera	Phalacridae	<i>Olibrus</i>	<i>evanescens</i>	c. Widespread	iv. Generalist	04. Common Resident

Class	Order	Family	Genus	Species	NSS Biogeography	NSS Ecological range	NSS Status
Insecta	Coleoptera	Staphylinidae	<i>Bledius</i>	<i>brincki</i>	c. Widespread	iv. Generalist	04. Common Resident
Insecta	Coleoptera	Staphylinidae	<i>Philonthus</i>	<i>nigrinus</i>	c. Widespread	iv. Generalist	04. Common Resident
Insecta	Coleoptera	Tenebrionidae	<i>Trachynotidus</i>	<i>rufozonatus</i>	c. Widespread	ii. Arid area specialist	04. Common Resident
Insecta	Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>cariniceps</i>	c. Widespread	ii. Arid area specialist	04. Common Resident
Insecta	Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>fortunata</i>	c. Widespread	ii. Arid area specialist	04. Common Resident
Insecta	Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>giessi</i>	c. Widespread	ii. Arid area specialist	04. Common Resident
Insecta	Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>hypallaga</i>	c. Widespread	ii. Arid area specialist	04. Common Resident
Insecta	Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>meridionalis</i>	c. Widespread	ii. Arid area specialist	04. Common Resident
Insecta	Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>mniszечи</i>	c. Widespread	ii. Arid area specialist	04. Common Resident
Insecta	Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>omnigena</i>	c. Widespread	ii. Arid area specialist	04. Common Resident
Insecta	Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>parentalis</i>	c. Widespread	ii. Arid area specialist	04. Common Resident
Insecta	Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>prevastitatis</i>	c. Widespread	ii. Arid area specialist	04. Common Resident
Insecta	Heteroptera	Lygaeidae	<i>Dieuches</i>	<i>herero</i>	c. Widespread	iv. Generalist	04. Common Resident
Insecta	Heteroptera	Lygaeidae	<i>Geocoris</i>	<i>scutellaris</i>	c. Widespread	iv. Generalist	04. Common Resident
Insecta	Heteroptera	Lygaeidae	<i>Geocoris</i>	<i>sjostedti</i>	c. Widespread	iv. Generalist	04. Common Resident
Insecta	Heteroptera	Pentatomidae	<i>Antestia</i>	<i>variegata</i>	c. Widespread	iv. Generalist	04. Common Resident
Insecta	Homoptera	Cicadellidae	<i>Aconurella</i>	<i>minutissima</i>	c. Widespread	iv. Generalist	04. Common Resident
Insecta	Homoptera	Cicadellidae	<i>Circulifer</i>	<i>tenellus</i>	c. Widespread	iv. Generalist	04. Common Resident
Insecta	Hymenoptera	Formicidae	<i>Camponotus</i>	<i>maculatus</i>	c. Widespread	iv. Generalist	04. Common Resident
Insecta	Hymenoptera	Formicidae	<i>Camponotus</i>	<i>mystaceus</i>	c. Widespread	iv. Generalist	04. Common Resident
Insecta	Hymenoptera	Mutillidae	<i>Strangulotilla</i>	<i>namibiana</i>	c. Widespread	iv. Generalist	04. Common Resident
Insecta	Isoptera	Hodotermitidae	<i>Hodotermes</i>	<i>mossambicus</i>	c. Widespread	iv. Generalist	04. Common Resident
Insecta	Lepidoptera	Noctuidae	<i>Cyligramma</i>	<i>latona</i>	c. Widespread	iv. Generalist	04. Common Resident
Insecta	Lepidoptera	Noctuidae	<i>Grammodes</i>	<i>stolida</i>	c. Widespread	iv. Generalist	04. Common Resident
Insecta	Lepidoptera	Sphingidae	<i>Celerio</i>	<i>lineata livornica</i>	c. Widespread	iv. Generalist	04. Common Resident
Insecta	Mantodea	Empusidae	<i>Empusa</i>	<i>guttula</i>	c. Widespread	iv. Generalist	04. Common Resident
Insecta	Neuroptera	Chrysopidae	<i>Italochrysa</i>	<i>turneri</i>	c. Widespread	iii. Habitat specialist	04. Common Resident
Insecta	Orthoptera	Acrididae	<i>Acrotylus</i>	<i>gracilis</i>	c. Widespread	iv. Generalist	04. Common Resident
Insecta	Orthoptera	Acrididae	<i>Acrotylus</i>	<i>patruelis</i>	c. Widespread	iv. Generalist	04. Common Resident
Insecta	Orthoptera	Acrididae	<i>Brachyphymus</i>	<i>vylderi</i>	c. Widespread	ii. Arid area specialist	04. Common Resident
Insecta	Orthoptera	Acrididae	<i>Lithidium</i>	<i>desertorum</i>	c. Widespread	ii. Arid area specialist	04. Common Resident
Insecta	Orthoptera	Acrididae	<i>Schistocerca</i>	<i>gregaria flaviventris</i>	c. Widespread	ii. Arid area specialist	04. Common Resident
Insecta	Orthoptera	Acrididae	<i>Sphingonotus</i>	<i>scabriculus</i>	c. Widespread	ii. Arid area specialist	04. Common Resident
Insecta	Thysanura	Lepismatidae	<i>Ctenolepisma</i>	<i>intercursa</i>	c. Widespread	iv. Generalist	04. Common Resident
Insecta	Thysanura	Lepismatidae	<i>Ctenolepisma</i>	<i>terebrans</i>	c. Widespread	iv. Generalist	04. Common Resident
Insecta	Coleoptera	Anthicidae	<i>Notoxus</i>	<i>holmi</i>	d. Bounding	iv. Generalist	04. Common Resident
Insecta	Coleoptera	Anthicidae	<i>Stenidius</i>	<i>namibianus</i>	d. Bounding	iv. Generalist	04. Common Resident

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Insecta	Coleoptera	Carabidae	<i>Cerapterus</i>	<i>hottentottus</i>	d. Bounding	iv. Generalist	04. Common Resident
Insecta	Coleoptera	Meloidae	<i>Cyaneolytta</i>	<i>granulipennis</i>	d. Bounding	iv. Generalist	04. Common Resident
Insecta	Coleoptera	Meloidae	<i>Hycleus</i>	<i>damarensis</i>	d. Bounding	iv. Generalist	04. Common Resident
Insecta	Coleoptera	Ochodaeidae	<i>Chaetocanthus</i>	<i>inseutus</i>	d. Bounding	iv. Generalist	04. Common Resident
Insecta	Coleoptera	Ochodaeidae	<i>Synochodaeus</i>	<i>modestus</i>	d. Bounding	iv. Generalist	04. Common Resident
Insecta	Coleoptera	Scarabaeidae	<i>Onthophagus</i>	<i>vylderi</i>	d. Bounding	iv. Generalist	04. Common Resident
Insecta	Coleoptera	Scarabaeidae	<i>Psammadius</i>	<i>evanidus</i>	d. Bounding	iv. Generalist	04. Common Resident
Insecta	Coleoptera	Scarabaeidae	<i>Temnorrhynchus</i>	<i>tridentatus</i>	d. Bounding	iv. Generalist	04. Common Resident
Insecta	Coleoptera	Staphylinidae	<i>Paederus</i>	<i>sabaesus</i>	d. Bounding	iv. Generalist	04. Common Resident
Insecta	Coleoptera	Staphylinidae	<i>Stenus</i>	<i>arenicola</i>	d. Bounding	iv. Generalist	04. Common Resident
Insecta	Coleoptera	Tenebrionidae	<i>Carchares</i>	<i>macer</i>	d. Bounding	iv. Generalist	04. Common Resident
Insecta	Coleoptera	Tenebrionidae	<i>Cyphostethe</i>	<i>tau</i>	d. Bounding	iv. Generalist	04. Common Resident
Insecta	Coleoptera	Tenebrionidae	<i>Somaticus</i>	<i>planatus</i>	d. Bounding	ii. Arid area specialist	04. Common Resident
Insecta	Coleoptera	Tenebrionidae	<i>Stenodesia</i>	<i>globulum</i>	d. Bounding	ii. Arid area specialist	04. Common Resident
Insecta	Diptera	Calliphoridae	<i>Lucilia</i>	<i>cuprina</i>	d. Bounding	iv. Generalist	04. Common Resident
Insecta	Diptera	Sarcophagidae	<i>Wohlfahrtia</i>	<i>pachytyli</i>	d. Bounding	iv. Generalist	04. Common Resident
Insecta	Lepidoptera	Sphingidae	<i>Hippotion</i>	<i>celerio</i>	d. Bounding	iv. Generalist	04. Common Resident
Insecta	Mantodea	Mantidae	<i>Galepsus</i>	<i>damaranus</i>	d. Bounding	ii. Arid area specialist	04. Common Resident
Insecta	Orthoptera	Acrididae	<i>Lithidiopsis</i>	<i>carinatus</i>	d. Bounding	ii. Arid area specialist	04. Common Resident
Insecta	Orthoptera	Acrididae	<i>Locustana</i>	<i>pardalina</i>	d. Bounding	ii. Arid area specialist	04. Common Resident
Insecta	Orthoptera	Pamphagidae	<i>Trachypetrella</i>	<i>anderssonii</i>	d. Bounding	ii. Arid area specialist	04. Common Resident
Insecta	Orthoptera	Schizodactylidae	<i>Comicus</i>	<i>capensis</i>	d. Bounding	ii. Arid area specialist	04. Common Resident
Insecta	Coleoptera	Buprestidae	<i>Julodis</i>	<i>garijepina</i>	d. Bounding	iv. Generalist	05. Rare Resident
Insecta	Coleoptera	Buprestidae	<i>Julodis</i>	<i>marmorea</i>	d. Bounding	iv. Generalist	05. Rare Resident
Insecta	Coleoptera	Buprestidae	<i>Julodis</i>	<i>vansonii</i>	d. Bounding	iv. Generalist	05. Rare Resident
Insecta	Coleoptera	Buprestidae	<i>Lepidoclema</i>	<i>magna</i>	d. Bounding	iv. Generalist	05. Rare Resident
Insecta	Coleoptera	Buprestidae	<i>Lepidoclema</i>	<i>parva</i>	d. Bounding	iv. Generalist	05. Rare Resident
Insecta	Isoptera	Termitidae	<i>Baucaliotermes</i>	<i>hainesi</i>	d. Bounding	iii. Habitat specialist	05. Rare Resident
Insecta	Phthiraptera	Hoplopleuridae	<i>Hoplopleura</i>	<i>patersoni</i>	d. Bounding	iii. Habitat specialist	05. Rare Resident
Insecta	Phthiraptera	Linognathidae	<i>Linognathus</i>	<i>antidorcitis</i>	d. Bounding	iii. Habitat specialist	05. Rare Resident
Insecta	Phthiraptera	Linognathidae	<i>Linognathus</i>	<i>oryx</i>	d. Bounding	iii. Habitat specialist	05. Rare Resident
Insecta	Phthiraptera	Menoponidae	<i>Afrimenopon</i>	<i>waar</i>	d. Bounding	iii. Habitat specialist	05. Rare Resident
Insecta	Phthiraptera	Menoponidae	<i>Ardeiphilus</i>	<i>vittatus</i>	d. Bounding	iii. Habitat specialist	05. Rare Resident
Insecta	Phthiraptera	Menoponidae	<i>Austromenopon</i>	<i>himantopi</i>	d. Bounding	iii. Habitat specialist	05. Rare Resident
Insecta	Phthiraptera	Philopteridae	<i>Austrogonoides</i>	<i>bifasciatus</i>	d. Bounding	iii. Habitat specialist	05. Rare Resident
Insecta	Phthiraptera	Philopteridae	<i>Austrogonoides</i>	<i>demersus</i>	d. Bounding	iii. Habitat specialist	05. Rare Resident
Insecta	Phthiraptera	Philopteridae	<i>Eidmanniella</i>	<i>pellucida</i>	d. Bounding	iii. Habitat specialist	05. Rare Resident

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Insecta	Phthiraptera	Philopteridae	<i>Eidmanniella</i>	<i>pustulosa</i>	d. Bounding	iii. Habitat specialist	05. Rare Resident
Insecta	Phthiraptera	Philopteridae	<i>Pectinopygus</i>	<i>acutifrons</i>	d. Bounding	iii. Habitat specialist	05. Rare Resident
Insecta	Phthiraptera	Philopteridae	<i>Pectinopygus</i>	<i>bassani</i>	d. Bounding	iii. Habitat specialist	05. Rare Resident
Insecta	Phthiraptera	Philopteridae	<i>Pectinopygus</i>	<i>gyricornis</i>	d. Bounding	iii. Habitat specialist	05. Rare Resident
Insecta	Phthiraptera	Philopteridae	<i>Quadriceps</i>	<i>sellatus</i>	d. Bounding	iii. Habitat specialist	05. Rare Resident
Insecta	Phthiraptera	Polyplacidae	<i>Neohaematopinus</i>	<i>faurei</i>	d. Bounding	iii. Habitat specialist	05. Rare Resident
Insecta	Phthiraptera	Polyplacidae	<i>Polyplax</i>	<i>hopkinsi</i>	d. Bounding	iii. Habitat specialist	05. Rare Resident
Insecta	Phthiraptera	Polyplacidae	<i>Polyplax</i>	<i>jonesi</i>	d. Bounding	iii. Habitat specialist	05. Rare Resident
Insecta	Phthiraptera	Polyplacidae	<i>Polyplax</i>	<i>roseinnesi</i>	d. Bounding	iii. Habitat specialist	05. Rare Resident
Insecta	Phthiraptera	Polyplacidae	<i>Scipio</i>	<i>tripedatus</i>	d. Bounding	iii. Habitat specialist	05. Rare Resident
Insecta	Phthiraptera	Trichodectidae	<i>Dasyonyx</i>	<i>ovalis</i>	d. Bounding	iii. Habitat specialist	05. Rare Resident
Insecta	Phthiraptera	Trichodectidae	<i>Felicola (Protelicola)</i>	<i>hyaenae</i>	d. Bounding	iii. Habitat specialist	05. Rare Resident
Insecta	Siphonaptera	Chimaeropsyllidae	<i>Chiastopsylla</i>	<i>nama</i>	d. Bounding	iii. Habitat specialist	05. Rare Resident
Insecta	Siphonaptera	Pulicidae	<i>Ctenocephalides</i>	<i>canis</i>	d. Bounding	iii. Habitat specialist	05. Rare Resident
Insecta	Siphonaptera	Pulicidae	<i>Ctenocephalides</i>	<i>felis</i>	d. Bounding	iii. Habitat specialist	05. Rare Resident
Insecta	Siphonaptera	Pulicidae	<i>Echidnophaga</i>	<i>larina</i>	d. Bounding	iii. Habitat specialist	05. Rare Resident
Insecta	Siphonaptera	Pulicidae	<i>Procaviopsylla</i>	<i>angolensis</i>	d. Bounding	iii. Habitat specialist	05. Rare Resident
Insecta	Thysanura	Lepismatidae	<i>Ctenolepisma</i>	<i>grandipalpis</i>	d. Bounding	iv. Generalist	05. Rare Resident
Insecta	Thysanura	Lepismatidae	<i>Ctenolepisma</i>	<i>pladica</i>	d. Bounding	ii. Arid area specialist	05. Rare Resident
Insecta	Thysanura	Lepismatidae	<i>Ctenolepisma</i>	<i>prompta</i>	d. Bounding	ii. Arid area specialist	05. Rare Resident
Insecta	Orthoptera	Gryllotalpidae	<i>Gryllotalpa</i>	<i>africana</i>	e. Sandwich	iii. Habitat specialist	05. Rare Resident
Insecta	Archaeognatha	Meinertellidae	<i>Machiloides</i>	<i>sp.</i>	b. Inselbergs	iv. Generalist	06. Relict
Insecta	Coleoptera	Buprestidae	<i>Acmaeodera</i>	<i>liessnerae</i>	b. Inselbergs	iv. Generalist	06. Relict
Insecta	Coleoptera	Buprestidae	<i>Acmaeodera</i>	<i>louwi</i>	b. Inselbergs	iv. Generalist	06. Relict
Insecta	Coleoptera	Buprestidae	<i>Nothomorpha</i>	<i>irishi</i>	b. Inselbergs	iv. Generalist	06. Relict
Insecta	Coleoptera	Tenebrionidae	<i>Stenocara</i>	<i>fitzsimonsi</i>	b. Inselbergs	ii. Arid area specialist	06. Relict
Insecta	Orthoptera	Lathiceridae	<i>Crypsicerus</i>	<i>cubicus</i>	d. Bounding	ii. Arid area specialist	06. Relict
Insecta	Homoptera	Acleridae	<i>Aclerda</i>	<i>namibensis</i>	a. Sand Sea	iii. Habitat specialist	07. Interdigitated resident
Insecta	Odonata	Coenagrionidae	<i>Ischnura</i>	<i>senegalensis</i>	b. Inselbergs	ii. Arid area specialist	07. Interdigitated resident
Insecta	Blattodea	Blattidae	<i>Pseudoderopeltis</i>	<i>areolata</i>	c. Widespread	ii. Arid area specialist	07. Interdigitated resident
Insecta	Blattodea	Derocalymnidae	<i>Derocalymma</i>	<i>kalahari</i>	c. Widespread	ii. Arid area specialist	07. Interdigitated resident
Insecta	Neuroptera	Myrmeleontidae	<i>Palparellus</i>	<i>ulrike</i>	c. Widespread	ii. Arid area specialist	07. Interdigitated resident
Insecta	Orthoptera	Tettigoniidae	<i>Phaneroptera</i>	<i>nana</i>	c. Widespread	iv. Generalist	07. Interdigitated resident
Insecta	Blattodea	Blaberidae	<i>Calolampra</i>	<i>pardalina</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Blattodea	Blatellidae	<i>Euandrobatta</i>	<i>ovambo</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Blattodea	Blattidae	<i>Deropeltis</i>	<i>erythrocephala</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Blattodea	Perisphaeridae	<i>Perisphaeria</i>	<i>scabrella</i>	d. Bounding	iv. Generalist	07. Interdigitated resident

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Insecta	Coleoptera	Anobiidae	<i>Lasioderma</i>	<i>serricorne</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Anthicidae	<i>Anthicus</i>	<i>instygius</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Anthicidae	<i>Anthicus</i>	<i>kochi</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Anthicidae	<i>Anthicus</i>	<i>stygius</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Anthicidae	<i>Endomia</i>	<i>crassicornis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Anthicidae	<i>Formicomus</i>	<i>caerulus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Anthicidae	<i>Formicomus</i>	<i>gestroi</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Anthicidae	<i>Formicomus</i>	<i>lacustris</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Anthicidae	<i>Formicomus</i>	<i>simplicicruralis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Anthicidae	<i>Hirticomus</i>	<i>biplagiatus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Anthicidae	<i>Notoxus</i>	<i>amaculatus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Anthicidae	<i>Notoxus</i>	<i>brutoni</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Anthicidae	<i>Notoxus</i>	<i>guttulatus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Anthicidae	<i>Notoxus</i>	<i>longitarsus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Anthicidae	<i>Notoxus</i>	<i>roeri</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Anthicidae	<i>Notoxus</i>	<i>venulethi</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Anthicidae	<i>Omonadus</i>	<i>floralis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Anthicidae	<i>Omonadus</i>	<i>robustithorax</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Anthicidae	<i>Pseudoleptaleus</i>	<i>unifasciatus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Anthicidae	<i>Sapintus</i>	<i>bayoni</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Anthicidae	<i>Sapintus</i>	<i>natalensis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Anthicidae	<i>Stricticomus</i>	<i>basiniger</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Anthicidae	<i>Tomoderus</i>	<i>fasciatus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Bostrychidae	<i>Calopertha</i>	<i>kalaharensis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Bostrychidae	<i>Enneadesmus</i>	<i>forficula</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Bostrychidae	<i>Lyctus</i>	<i>brunneus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Bostrychidae	<i>Sinoxylon</i>	<i>transvaalense</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Bostrychidae	<i>Xylion</i>	<i>adustus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Bostrychidae	<i>Xylion</i>	<i>plurispinius</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Bostrychidae	<i>Xylion</i>	<i>plurispinius</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Bostrychidae	<i>Xylionulus</i>	<i>pussilus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Bostrychidae	<i>Xylionulus</i>	<i>transvena</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Bostrychidae	<i>Xylopertha</i>	<i>picea</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Brentidae	<i>Orfilaia</i>	<i>vulsellata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Bruchidae	<i>Bruchidius</i>	<i>senegalensis</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Coleoptera	Bruchidae	<i>Bruchidius</i>	<i>senegalensis</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Coleoptera	Bruchidae	<i>Caryedon</i>	<i>multinotatus</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident

Class	Order	Family	Genus	Species	NSS Biogeography	NSS Ecological range	NSS Status
Insecta	Coleoptera	Bruchidae	<i>Spermophagus</i>	<i>humilis</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Coleoptera	Bruchidae	<i>Spermophagus</i>	<i>marmoreus</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Coleoptera	Bruchidae	<i>Spermophagus</i>	<i>monardi</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Coleoptera	Bruchidae	<i>Spermophagus</i>	<i>niveoguttatus</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Coleoptera	Buprestidae	<i>Acmaeodera</i>	<i>excellens</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Buprestidae	<i>Acmaeodera</i>	<i>grata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Buprestidae	<i>Agrilus</i>	<i>sexguttatus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Buprestidae	<i>Chalcogenia</i>	<i>sculptilis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Buprestidae	<i>Chrysobothris</i>	<i>dorsata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Buprestidae	<i>Julodis</i>	<i>egho</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Buprestidae	<i>Julodis</i>	<i>humeralis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Buprestidae	<i>Polycestina</i>	<i>damarana</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Carabidae	<i>Anthia</i>	<i>circumscripta</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Carabidae	<i>Anthia</i>	<i>thoracica</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Carabidae	<i>Calosoma</i>	<i>imbricatum</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Carabidae	<i>Caminara</i>	<i>chlorostictum</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Carabidae	<i>Chlaeniostenus</i>	<i>sulcipennis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Carabidae	<i>Chlaenius</i>	<i>ovampo</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Carabidae	<i>Chlaenius</i>	<i>senegalensis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Carabidae	<i>Clivina</i>	<i>lacustris</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Carabidae	<i>Ctenosta</i>	<i>senegalense</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Carabidae	<i>Dyschiriodes</i>	<i>exaratus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Carabidae	<i>Dyschiriodes</i>	<i>schaumi</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Carabidae	<i>Dyschiriodes</i>	<i>zanzibaricus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Carabidae	<i>Eurymorpha</i>	<i>cyanipes</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Coleoptera	Carabidae	<i>Graphipterus</i>	<i>amabilis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Carabidae	<i>Graphipterus</i>	<i>angustus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Carabidae	<i>Graphipterus</i>	<i>circumcinctus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Carabidae	<i>Graphipterus</i>	<i>cordiger</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Carabidae	<i>Graphipterus</i>	<i>damarensis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Carabidae	<i>Graphipterus</i>	<i>namanus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Carabidae	<i>Graphipterus</i>	<i>velox</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Carabidae	<i>Habrodera</i>	<i>nilotica</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Carabidae	<i>Harpalus</i>	<i>natalensis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Carabidae	<i>Lebia</i>	<i>umtalina</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Carabidae	<i>Lophyra</i>	<i>damara</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Carabidae	<i>Microlestes</i>	<i>capensis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident

Class	Order	Family	Genus	Species	NSS Biogeography	NSS Ecological range	NSS Status
Insecta	Coleoptera	Carabidae	<i>Myriochile</i>	<i>melancholica</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Carabidae	<i>Omophron</i>	<i>picturatus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Carabidae	<i>Passalidius</i>	<i>fortipes</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Carabidae	<i>Platychile</i>	<i>pallida</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Coleoptera	Carabidae	<i>Thermophilum</i>	<i>homoplatum</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Cerambycidae	<i>Anthracoentrus</i>	<i>capensis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Cerambycidae	<i>Crossotus</i>	<i>plumicornis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Cerambycidae	<i>Crossotus</i>	<i>stypticus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Cerambycidae	<i>Derolus</i>	<i>duffy</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Cerambycidae	<i>Ecyroschema</i>	<i>favosa</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Cerambycidae	<i>Eunidia</i>	<i>nebulosa</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Cerambycidae	<i>Idactus</i>	<i>strandii</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Cerambycidae	<i>Macrotoma</i>	<i>palmata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Cerambycidae	<i>Ossibia</i>	<i>fuscata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Cerambycidae	<i>Prosopocera</i>	<i>inermis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Cerambycidae	<i>Prosopocera</i>	<i>lactator</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Cerambycidae	<i>Tetradia</i>	<i>lophoptera</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Cerambycidae	<i>Zoodes</i>	<i>liturifer</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Chrysomelidae	<i>Acolastus</i>	<i>ornatipennis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Chrysomelidae	<i>Altica</i>	<i>madagascariensis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Chrysomelidae	<i>Trichaspis</i>	<i>pilosula</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Cleridae	<i>Eunatalis</i>	<i>parva</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Coccinellidae	<i>Afidenta</i>	<i>godarti</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Coccinellidae	<i>Cheilomenes</i>	<i>sulphurea</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Coccinellidae	<i>Exochomus</i>	<i>troberti</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Coccinellidae	<i>Hippodamia</i>	<i>variegata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Coccinellidae	<i>Isora</i>	<i>circularis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Coccinellidae	<i>Nephus</i>	<i>whiteheadi</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Coccinellidae	<i>Rodolia</i>	<i>argodi</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Coccinellidae	<i>Scymnus</i>	<i>derelictus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Coccinellidae	<i>Scymnus</i>	<i>kibonotensis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Coccinellidae	<i>Scymnus</i>	<i>nubilus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Coccinellidae	<i>Scymnus</i>	<i>pallidulus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Coccinellidae	<i>Scymnus</i>	<i>pruinosis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Coccinellidae	<i>Xanthadalia</i>	<i>effusa</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Curculionidae	<i>Brachycerus</i>	<i>apterus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Curculionidae	<i>Brachycerus</i>	<i>ornatus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident

Class	Order	Family	Genus	Species	NSS Biogeography	NSS Ecological range	NSS Status
Insecta	Coleoptera	Curculionidae	<i>Episus</i>	<i>contractus</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Coleoptera	Curculionidae	<i>Episus</i>	<i>impressicollis</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Coleoptera	Curculionidae	<i>Episus</i>	<i>inermicollis</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Coleoptera	Curculionidae	<i>Microlarinus</i>	<i>lypriformis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Curculionidae	<i>Rhynchaenus</i>	<i>minisculus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Curculionidae	<i>Sibinia</i>	<i>luteoviridis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Curculionidae	<i>Sibinia</i>	<i>micros</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Dermestidae	<i>Attagenus</i>	<i>auronotatus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Dermestidae	<i>Attagenus</i>	<i>fasciatus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Dermestidae	<i>Attagenus</i>	<i>jucundus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Dermestidae	<i>Dermestes</i>	<i>maculatus</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Coleoptera	Drilidae	<i>Selasia</i>	<i>pulchra</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Coleoptera	Dytiscidae	<i>Bidessus</i>	<i>complicatus</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Coleoptera	Dytiscidae	<i>Bidessus</i>	<i>nero</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Coleoptera	Dytiscidae	<i>Bidessus</i>	<i>sharpi</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Coleoptera	Dytiscidae	<i>Copelatus</i>	<i>kalaharii</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Coleoptera	Dytiscidae	<i>Cybister</i>	<i>tripunctatus</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Coleoptera	Dytiscidae	<i>Hydaticus</i>	<i>bivittatus</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Coleoptera	Dytiscidae	<i>Hydroglyphus</i>	<i>geminodes</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Coleoptera	Dytiscidae	<i>Hydroglyphus</i>	<i>kalaharii</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Coleoptera	Dytiscidae	<i>Hydroglyphus</i>	<i>zanzibarensis</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Coleoptera	Dytiscidae	<i>Hydrovatus</i>	<i>regimbarti</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Coleoptera	Dytiscidae	<i>Hydrovatus</i>	<i>simoni</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Coleoptera	Dytiscidae	<i>Leiodytes</i>	<i>australis</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Coleoptera	Dytiscidae	<i>Platydytes</i>	<i>coarctaticollis</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Coleoptera	Dytiscidae	<i>Yola</i>	<i>tuberculata</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Coleoptera	Elateridae	<i>Anchastus</i>	<i>granulipennis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Erotylidae	<i>Amblyscelis</i>	<i>kelleni</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Geotrupidae	<i>Namibiobolbus</i>	<i>iphicles</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Coleoptera	Gyrinidae	<i>Dineutus</i>	<i>aereus</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Coleoptera	Heteroceridae	<i>Heterocerus</i>	<i>elongatus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Heteroceridae	<i>Heterocerus</i>	<i>ornatus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Heteroceridae	<i>Heterocerus</i>	<i>thebaicus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Heteroceridae	<i>Heterocerus</i>	<i>vulpes</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Histeridae	<i>Chalcionellus</i>	<i>amoenulus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Histeridae	<i>Exosternus</i>	<i>amphibius</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Histeridae	<i>Hister</i>	<i>coprophilis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident

Class	Order	Family	Genus	Species	NSS Biogeography	NSS Ecological range	NSS Status
Insecta	Coleoptera	Histeridae	<i>Hypocacculus</i>	<i>kalahari</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Histeridae	<i>Hypocacculus</i>	<i>roeri</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Histeridae	<i>Hypocacculus</i>	<i>veris</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Histeridae	<i>Macrolister</i>	<i>latipes</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Histeridae	<i>Pachylister</i>	<i>nigrita</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Histeridae	<i>Saprinus</i>	<i>bicolor</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Histeridae	<i>Saprinus</i>	<i>cruciatus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Histeridae	<i>Saprinus</i>	<i>pseudobicolor</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Histeridae	<i>Saprinus</i>	<i>pulcher</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Histeridae	<i>Saprinus</i>	<i>splendens</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Histeridae	<i>Tribalus</i>	<i>subdolos</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Hybosoridae	<i>Hybosorus</i>	<i>illigeri</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Hydrophilidae	<i>Allocotocerus</i>	<i>subaeneus</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Coleoptera	Hydrophilidae	<i>Berosus</i>	<i>cuspidatus</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Coleoptera	Hydrophilidae	<i>Berosus</i>	<i>kalahariensis</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Coleoptera	Hydrophilidae	<i>Berosus</i>	<i>nigriceps</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Coleoptera	Hydrophilidae	<i>Berosus</i>	<i>vitticollis</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Coleoptera	Hydrophilidae	<i>Berosus</i>	<i>wewalkai</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Coleoptera	Hydrophilidae	<i>Cercyon</i>	<i>aphodioides</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Coleoptera	Hydrophilidae	<i>Chasmogenus</i>	<i>africanus</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Coleoptera	Hydrophilidae	<i>Enochrus</i>	<i>natalensis</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Coleoptera	Hydrophilidae	<i>Enochrus</i>	<i>rubidus</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Coleoptera	Hydrophilidae	<i>Helochares</i>	<i>pallens</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Coleoptera	Hydrophilidae	<i>Laccobius</i>	<i>leucaspis</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Coleoptera	Hydrophilidae	<i>Paracymus</i>	<i>chalceus</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Coleoptera	Hydrophilidae	<i>Psalitrus</i>	<i>villiersi</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Coleoptera	Lathridiidae	<i>Corticaria</i>	<i>elongata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Latridiidae	<i>Melanophthalma</i>	<i>capicola</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Latridiidae	<i>Melanophthalma</i>	<i>ophthalmica</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Lyctidae	<i>Lyctus</i>	<i>africanus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Malachiidae	<i>Hapalochrus</i>	<i>sumtuosus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Malachiidae	<i>Metaphilhedonus</i>	<i>hobohmi</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Malachiidae	<i>Urodactylus</i>	<i>uncipennis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Meloidae	<i>Actenodia</i>	<i>chrysomelina</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Meloidae	<i>Afrolytta</i>	<i>carneola</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Meloidae	<i>Ceroctis</i>	<i>amphibia</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Meloidae	<i>Ceroctis</i>	<i>bohemanni</i>	d. Bounding	iv. Generalist	07. Interdigitated resident

Class	Order	Family	Genus	Species	NSS Biogeography	NSS Ecological range	NSS Status
Insecta	Coleoptera	Meloidae	<i>Ceroctis</i>	<i>braunsiana</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Meloidae	<i>Ceroctis</i>	<i>korana</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Meloidae	<i>Ceroctis</i>	<i>peringueyi</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Meloidae	<i>Ceroctis</i>	<i>trifasciata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Meloidae	<i>Cyaneolytta</i>	<i>resplendens</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Meloidae	<i>Hycleus</i>	<i>basibicinctus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Meloidae	<i>Hycleus</i>	<i>bifucatus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Meloidae	<i>Hycleus</i>	<i>burmeisteri</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Meloidae	<i>Hycleus</i>	<i>decoratus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Meloidae	<i>Hycleus</i>	<i>dentatus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Meloidae	<i>Hycleus</i>	<i>haemactus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Meloidae	<i>Hycleus</i>	<i>hybridus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Meloidae	<i>Hycleus</i>	<i>matabele</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Meloidae	<i>Hycleus</i>	<i>oculatus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Meloidae	<i>Hycleus</i>	<i>peringueyi</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Meloidae	<i>Hycleus</i>	<i>pilosus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Meloidae	<i>Hycleus</i>	<i>politus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Meloidae	<i>Hycleus</i>	<i>scalaris</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Meloidae	<i>Iselma</i>	<i>hobohmi</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Meloidae	<i>Lydomorphus</i>	<i>bisignatus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Meloidae	<i>Lydomorphus</i>	<i>mimus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Meloidae	<i>Mimesthes</i>	<i>maculicollis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Meloidae	<i>Paractenodia</i>	<i>damarensis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Meloidae	<i>Paractenodia</i>	<i>glabra</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Meloidae	<i>Prionotolytta</i>	<i>binotata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Meloidae	<i>Psalydolytta</i>	<i>lorigera</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Meloidae	<i>Zonitomorpha</i>	<i>costata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Melyridae	<i>Attalus</i>	<i>robusticeps</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Melyridae	<i>Attalusinus</i>	<i>dentipes</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Melyridae	<i>Colotrema</i>	<i>pallidula</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Monommiidae	<i>Monomma</i>	<i>rufipes</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Mordellidae	<i>Ctenidia</i>	<i>mordelloides</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Nitidulidae	<i>Amphicrossus</i>	<i>natalensis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Nitidulidae	<i>Anister</i>	<i>raffrayi</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Nitidulidae	<i>Carpophilus</i>	<i>hemipterus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Nitidulidae	<i>Lorditus</i>	<i>tibialis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Nitidulidae	<i>Meligethes</i>	<i>aurimaculatus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident

Class	Order	Family	Genus	Species	NSS Biogeography	NSS Ecological range	NSS Status
Insecta	Coleoptera	Nitidulidae	<i>Meligethes</i>	<i>clyprogethus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Nitidulidae	<i>Meligethes</i>	<i>serrator</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Nitidulidae	<i>Pria</i>	<i>angustula</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Phalacridae	<i>Olibrus</i>	<i>rufoterminalis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Phalacridae	<i>Stilbus</i>	<i>obliquus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Anachalcos</i>	<i>convexus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Anomala</i>	<i>distanti</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Aphodius</i>	<i>copulatus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Aphodius</i>	<i>dorsalis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Aphodius</i>	<i>flavus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Aphodius</i>	<i>gnu</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Aphodius</i>	<i>kalaharicus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Aphodius</i>	<i>lividus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Aphodius</i>	<i>merula</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Aphodius</i>	<i>pseudolividus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Aphodius</i>	<i>sublividus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Aphodius</i>	<i>transvaalicus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Caccobius</i>	<i>ferrugineus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Catharsius</i>	<i>calaharicus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Catharsius</i>	<i>melancholicus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Cheirolasia</i>	<i>burkei</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Copris</i>	<i>elphenor</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Copris</i>	<i>fallax</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Dicronorrhina</i>	<i>derbyana</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Diplognatha</i>	<i>gagates</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Dischista</i>	<i>cincta</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Dischista</i>	<i>rufa</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Gymnopleurus</i>	<i>virens</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Hypselogenia</i>	<i>geotrupina</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Leucocelis</i>	<i>amethystina</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Leucocelis</i>	<i>vitticollis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Mausoleopsis</i>	<i>amabilis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Metacatharsius</i>	<i>exiguus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Omocnemus</i>	<i>kochi</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Onitis</i>	<i>alexis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Onitis</i>	<i>mendax</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Onitis</i>	<i>mniszewski</i>	d. Bounding	iv. Generalist	07. Interdigitated resident

Class	Order	Family	Genus	Species	NSS Biogeography	NSS Ecological range	NSS Status
Insecta	Coleoptera	Scarabaeidae	<i>Onthophagus</i>	<i>gazella</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Onthophagus</i>	<i>plebejus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Onthophagus</i>	<i>vinctus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Oryctes</i>	<i>boas</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Pachnoda</i>	<i>sinuata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Pachnodella</i>	<i>impressa</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Pedaria</i>	<i>picea</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Peritrichia</i>	<i>ditissima</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Peritrichia</i>	<i>flavoornata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Phoxomeloides</i>	<i>bella</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Plaesiorrhinella</i>	<i>trivittata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Pleurophorus</i>	<i>africanus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Polybaphes</i>	<i>balteata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Proagoderus</i>	<i>rangifer</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Proagoderus</i>	<i>sapphirinus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Rhabdotis</i>	<i>semipunctata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Rhizoplatys</i>	<i>bituberculatus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Rhysemus</i>	<i>bechuanensis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Rhysemus</i>	<i>mimus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Scapanoclypeus</i>	<i>aberrans</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Scapanoclypeus</i>	<i>aulacocoleatus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Scarabaeus</i>	<i>ambiguus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Scarabaeus</i>	<i>damarensis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Scarabaeus</i>	<i>hottentorum</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Sparrmannia</i>	<i>flava</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Temnorrhynchus</i>	<i>coronatus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Tephraea</i>	<i>leucomelona</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Tephraea</i>	<i>morosa</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scarabaeidae	<i>Xeloma</i>	<i>maura</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Scolytidae	<i>Hapalogenius</i>	<i>africanus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Silvanidae	<i>Oryzaephilus</i>	<i>gibbosus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Silvanidae	<i>Oryzaephilus</i>	<i>surinamensis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Silvanidae	<i>Silvanus</i>	<i>recticollis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Spercheidae	<i>Spercheus</i>	<i>senegalensis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Staphylinidae	<i>Aleochara</i>	<i>bipustulata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Staphylinidae	<i>Aleochara</i>	<i>bisolata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Staphylinidae	<i>Aleochara</i>	<i>mahagi</i>	d. Bounding	iv. Generalist	07. Interdigitated resident

Class	Order	Family	Genus	Species	NSS Biogeography	NSS Ecological range	NSS Status
Insecta	Coleoptera	Staphylinidae	<i>Aleochara</i>	<i>salsipotens</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Staphylinidae	<i>Aleochara</i>	<i>trivialis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Staphylinidae	<i>Bledius</i>	<i>michaelseni</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Staphylinidae	<i>Bledius</i>	<i>subopacus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Staphylinidae	<i>Bledius</i>	<i>tuberculatus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Staphylinidae	<i>Cafius</i>	<i>xantholoma</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Staphylinidae	<i>Leucoparyphus</i>	<i>silphoides</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Staphylinidae	<i>Myllaena</i>	<i>sebastiani</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Staphylinidae	<i>Oxyteles</i>	<i>varipennis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Staphylinidae	<i>Oxytelus</i>	<i>fulgidus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Staphylinidae	<i>Oxytelus</i>	<i>varipennis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Staphylinidae	<i>Paramyrmoecia</i>	<i>bipustulata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Staphylinidae	<i>Philonthus</i>	<i>caffer</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Staphylinidae	<i>Philonthus</i>	<i>quadripunctulus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Staphylinidae	<i>Scopaeus</i>	<i>filiformis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Staphylinidae	<i>Scopaeus</i>	<i>mendosus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Staphylinidae	<i>Scopaeus</i>	<i>punctatellus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Staphylinidae	<i>Stenus</i>	<i>furcifer</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Staphylinidae	<i>Stenus</i>	<i>mendicus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Staphylinidae	<i>Stenus</i>	<i>prospector</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Staphylinidae	<i>Stichodonia</i>	<i>bisulcata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Staphylinidae	<i>Stilicus</i>	<i>bimaculatum</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Staphylinidae	<i>Zyras</i>	<i>bipunctatus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Staphylinidae	<i>Zyras</i>	<i>invictus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Staphylinidae	<i>Zyras</i>	<i>modestus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Tenebrionidae	<i>Asphaltesthes</i>	<i>impressipennis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Tenebrionidae	<i>Decoriplus</i>	<i>hieroglyphicus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Tenebrionidae	<i>Derosphaerius</i>	<i>humilis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Tenebrionidae	<i>Diestecopus</i>	<i>histrion</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Tenebrionidae	<i>Epiphysa</i>	<i>flavicollis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Tenebrionidae	<i>Epiphysa</i>	<i>latisterna</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Tenebrionidae	<i>Eustolopus</i>	<i>octoseriatus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Tenebrionidae	<i>Gonopus</i>	<i>angusticostis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Tenebrionidae	<i>Gonopus</i>	<i>tibialis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Tenebrionidae	<i>Homebius</i>	<i>kaszabi</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Tenebrionidae	<i>Horatoma</i>	<i>carinulata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Tenebrionidae	<i>Pachyphaleria</i>	<i>capensis</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident

Class	Order	Family	Genus	Species	NSS Biogeography	NSS Ecological range	NSS Status
Insecta	Coleoptera	Tenebrionidae	<i>Parastizopus</i>	<i>armaticeps</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Tenebrionidae	<i>Phanerotomea</i>	<i>gibberosulum</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Tenebrionidae	<i>Physadesmia</i>	<i>globosa</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Coleoptera	Tenebrionidae	<i>Physosterna</i>	<i>cribripes</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Coleoptera	Tenebrionidae	<i>Psammodes</i>	<i>vialis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Tenebrionidae	<i>Renatiella</i>	<i>scrobipennis</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Coleoptera	Tenebrionidae	<i>Rhammatodes</i>	<i>aequalipennis</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Coleoptera	Tenebrionidae	<i>Rhammatodes</i>	<i>longicornis</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Coleoptera	Tenebrionidae	<i>Rhammatodes</i>	<i>subcostatus</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Coleoptera	Tenebrionidae	<i>Rhammatodes</i>	<i>tagenesthoides</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Coleoptera	Tenebrionidae	<i>Somaticus</i>	<i>aeneus</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Coleoptera	Tenebrionidae	<i>Somaticus</i>	<i>bohemani</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Coleoptera	Tenebrionidae	<i>Somaticus</i>	<i>strangulatus</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Coleoptera	Tenebrionidae	<i>Somaticus</i>	<i>trachyderes</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Coleoptera	Tenebrionidae	<i>Somaticus</i>	<i>wahlbergi</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Coleoptera	Tenebrionidae	<i>Stenocara</i>	<i>aenescens</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Coleoptera	Tenebrionidae	<i>Stenocara</i>	<i>gracilipes</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Coleoptera	Tenebrionidae	<i>Stips</i>	<i>dohrni</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Coleoptera	Tenebrionidae	<i>Stips</i>	<i>stali</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Coleoptera	Tenebrionidae	<i>Stipsostoma</i>	<i>sculpta</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Coleoptera	Trogidae	<i>Trox</i>	<i>asperulatus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Trogidae	<i>Trox</i>	<i>elevatus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Trogidae	<i>Trox</i>	<i>foveolatus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Trogidae	<i>Trox</i>	<i>rusticus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Coleoptera	Urodontidae	<i>Urodontus</i>	<i>inconstans</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Dermaptera	Forficulidae	<i>Forficula</i>	<i>senegalensis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Dermaptera	Labiduridae	<i>Labidura</i>	<i>riparia</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Diptera	Anthomyiidae	<i>Fucellia</i>	<i>capensis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Asilidae	<i>Afromelittodes</i>	<i>mimos</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Asilidae	<i>Afromochtherus</i>	<i>mendax</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Asilidae	<i>Anasillomos</i>	<i>chrysopos</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Asilidae	<i>Euscelidia</i>	<i>peteraxi</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Asilidae	<i>Laphystia</i>	<i>argenteofasciata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Asilidae	<i>Laphystia</i>	<i>gigantella</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Asilidae	<i>Neolophonotus</i>	<i>amplus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Asilidae	<i>Neolophonotus</i>	<i>brunales</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Asilidae	<i>Neolophonotus</i>	<i>circus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident

Class	Order	Family	Genus	Species	NSS Biogeography	NSS Ecological range	NSS Status
Insecta	Diptera	Asilidae	<i>Neolophonotus</i>	<i>kalahari</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Asilidae	<i>Neolophonotus</i>	<i>stuckenbergi</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Asilidae	<i>Pegesimallus</i>	<i>pedunculatus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Asilidae	<i>Stichopogon</i>	<i>caffer</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Asilidae	<i>Stichopogon</i>	<i>engeli</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Asilidae	<i>Stichopogon</i>	<i>hermanni</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Asilidae	<i>Stichopogon</i>	<i>punctum</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Bombyliidae	<i>Anthrax</i>	<i>doliops</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Bombyliidae	<i>Bombylisoma</i>	<i>kaokoense</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Bombyliidae	<i>Eurycarenum</i>	<i>minus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Bombyliidae	<i>Exoprosopa</i>	<i>cervina</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Bombyliidae	<i>Exoprosopa</i>	<i>hypargyra</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Bombyliidae	<i>Exoprosopa</i>	<i>luteicosta</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Bombyliidae	<i>Exoprosopa</i>	<i>punctulata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Bombyliidae	<i>Geron</i>	<i>garipeinus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Bombyliidae	<i>Geron</i>	<i>nomadicus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Bombyliidae	<i>Heteralonia</i>	<i>mira</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Bombyliidae	<i>Hyperusia</i>	<i>muscoides</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Bombyliidae	<i>Spogostylum</i>	<i>incisurale</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Bombyliidae	<i>Villa</i>	<i>lasia</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Calliphoridae	<i>Chrysomya</i>	<i>chloropyga</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Calliphoridae	<i>Cordylobia</i>	<i>anthropophaga</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Calliphoridae	<i>Isomyia</i>	<i>natalensis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Calliphoridae	<i>Lucilia</i>	<i>sericata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Calliphoridae	<i>Rhinia</i>	<i>apicalis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Calliphoridae	<i>Rhyncomyia</i>	<i>interclusa</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Camillidae	<i>Katamilla</i>	<i>procavia</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Canacidae	<i>Canace</i>	<i>rossii</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Canacidae	<i>Dynomiella</i>	<i>stuckenbergi</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Ceratopogonidae	<i>Culicoides</i>	<i>schultzei</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Ceratopogonidae	<i>Leptoconops</i>	<i>interruptus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Chloropidae	<i>Eutropha</i>	<i>lindneri</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Culicidae	<i>Aedes</i>	<i>aegypti</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Culicidae	<i>Culex</i>	<i>ethiopicus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Curtonotidae	<i>Curtonotum</i>	<i>cuthbertsoni</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Dolichopodidae	<i>Hydrophorus</i>	<i>praecox</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Ephydriidae	<i>Ephydra</i>	<i>stuckenbergi</i>	d. Bounding	iv. Generalist	07. Interdigitated resident

Class	Order	Family	Genus	Species	NSS Biogeography	NSS Ecological range	NSS Status
Insecta	Diptera	Hippoboscidae	<i>Hippobosca</i>	<i>rufipes</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Hippoboscidae	<i>Hippobosca</i>	<i>struthionis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Milichiidae	<i>Desmometopa</i>	<i>m-nigrum</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Muscidae	<i>Musca</i>	<i>conducens</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Muscidae	<i>Musca</i>	<i>sorbens</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Mythicomyiidae	<i>Doliopteryx</i>	<i>ecphata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Mythicomyiidae	<i>Doliopteryx</i>	<i>welwitschia</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Pipunculidae	<i>Clistoabdominalis</i>	<i>lomholdti</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Psychodidae	<i>Sergentomyia</i>	<i>rima</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Diptera	Sarcophagidae	<i>Chauliooestrus</i>	<i>leza</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Sarcophagidae	<i>Khowaba</i>	<i>atrox</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Scenopinidae	<i>Scenopinus</i>	<i>fenestralis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Sepsidae	<i>Sepsis</i>	<i>niveipennis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Sepsidae	<i>Toxopoda</i>	<i>nitida</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Simuliidae	<i>Prosimulium</i>	<i>damarense</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Syrphidae	<i>Ceriodes</i>	<i>caffra</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Syrphidae	<i>Eristalinus</i>	<i>tabanoides</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Syrphidae	<i>Eumerus</i>	<i>obliquus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Syrphidae	<i>Eumerus</i>	<i>triangularis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Syrphidae	<i>Ischiodon</i>	<i>aegyptus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Syrphidae	<i>Syritta</i>	<i>flaviventris</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Tabanidae	<i>Limata</i>	<i>kuehnelti</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Diptera	Tephritidae	<i>Ceratitis</i>	<i>quinaria</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Diptera	Tephritidae	<i>Coelotrypes</i>	<i>vittatus</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Diptera	Tephritidae	<i>Dacus</i>	<i>bistrigulatus</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Diptera	Tephritidae	<i>Dacus</i>	<i>ciliatus</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Diptera	Tephritidae	<i>Dacus</i>	<i>ciliatus</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Diptera	Tephritidae	<i>Desmella</i>	<i>clarinetta</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Diptera	Tephritidae	<i>Dioxyna</i>	<i>sororcula</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Diptera	Tephritidae	<i>Euryphalara</i>	<i>barnardi</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Diptera	Tephritidae	<i>Euryphalara</i>	<i>extensa</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Diptera	Tephritidae	<i>Euryphalara</i>	<i>mecistocephala</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Diptera	Tephritidae	<i>Goniurellia</i>	<i>munroi</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Diptera	Tephritidae	<i>Hyaloctoides</i>	<i>semiater</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Diptera	Tephritidae	<i>Hyaloctoides</i>	<i>superhyalinus</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Diptera	Tephritidae	<i>Hyalotephritis</i>	<i>australis</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Diptera	Tephritidae	<i>Leucothrix</i>	<i>barbata</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident

Class	Order	Family	Genus	Species	NSS Biogeography	NSS Ecological range	NSS Status
Insecta	Diptera	Tephritidae	<i>Metasphenisca</i>	<i>rubida</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Diptera	Tephritidae	<i>Platomma</i>	<i>luniferum</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Diptera	Tephritidae	<i>Trupanea</i>	<i>subsetosa</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Diptera	Tephritidae	<i>Trupanea</i>	<i>xanthochaeta</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Diptera	Tethinidae	<i>Afrotethina</i>	<i>stuckenbergi</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Therevidae	<i>Phycus</i>	<i>niger</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Therevidae	<i>Rueppellia</i>	<i>basalis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Therevidae	<i>Stenogephyra</i>	<i>torrida</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Trioxscelididae	<i>Trioxscelis</i>	<i>lindneri</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Diptera	Ulidiidae	<i>Melieria</i>	<i>nigritarsis</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Heteroptera	Alydidae	<i>Euthetus</i>	<i>leucostictus</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Heteroptera	Alydidae	<i>Nemausus</i>	<i>sordidatus</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Heteroptera	Belostomatidae	<i>Lethocerus</i>	<i>cordofanus</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Heteroptera	Cimicidae	<i>Aphrania</i>	<i>barys</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Heteroptera	Coreidae	<i>Anoplocnemis</i>	<i>curvipes</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Heteroptera	Coreidae	<i>Leptocoris</i>	<i>cinnamomensis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Heteroptera	Coreidae	<i>Leptoglossus</i>	<i>membranaceus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Heteroptera	Corixidae	<i>Corixa</i>	<i>hieroglyphica</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Heteroptera	Corixidae	<i>Micronecta</i>	<i>browni</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Heteroptera	Corixidae	<i>Sigara</i>	<i>wahlbergi</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Heteroptera	Gerridae	<i>Gerris</i>	<i>swakopensis</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Heteroptera	Lygaeidae	<i>Corizus</i>	<i>natalensis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Heteroptera	Lygaeidae	<i>Corizus</i>	<i>scutellaris</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Heteroptera	Lygaeidae	<i>Dieuches</i>	<i>abundans</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Heteroptera	Lygaeidae	<i>Engistus</i>	<i>hottentotti</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Heteroptera	Lygaeidae	<i>Eranchiellus</i>	<i>slateri</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Heteroptera	Lygaeidae	<i>Geocoris</i>	<i>megacephalus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Heteroptera	Lygaeidae	<i>Geocoris</i>	<i>pallidipennis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Heteroptera	Lygaeidae	<i>Hyalochilus</i>	<i>scudderi</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Heteroptera	Lygaeidae	<i>Leptodemus</i>	<i>irroratus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Heteroptera	Lygaeidae	<i>Melanostethus</i>	<i>marginatus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Heteroptera	Lygaeidae	<i>Microspilus</i>	<i>kafferensis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Heteroptera	Lygaeidae	<i>Nysius</i>	<i>binotatus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Heteroptera	Lygaeidae	<i>Nysius</i>	<i>natalensis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Heteroptera	Lygaeidae	<i>Paromius</i>	<i>gracilis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Heteroptera	Lygaeidae	<i>Remundiareana</i>	<i>horvathi</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Heteroptera	Lygaeidae	<i>Spilostethus</i>	<i>pandurus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident

Class	Order	Family	Genus	Species	NSS Biogeography	NSS Ecological range	NSS Status
Insecta	Heteroptera	Nabidae	<i>Nabis</i>	<i>capsiformis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Heteroptera	Naucoridae	<i>Laccocoris</i>	<i>limigenus</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Heteroptera	Nepidae	<i>Laccotrephes</i>	<i>fabricii</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Heteroptera	Notonectidae	<i>Anisops</i>	<i>hancocki</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Heteroptera	Notonectidae	<i>Anisops</i>	<i>sardea</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Heteroptera	Notonectidae	<i>Anisops</i>	<i>varia</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Heteroptera	Notonectidae	<i>Enithares</i>	<i>sobria</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Heteroptera	Pentatomidae	<i>Bagrada</i>	<i>hilaris</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Heteroptera	Pentatomidae	<i>Nezara</i>	<i>viridula</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Heteroptera	Pyrrhocoridae	<i>Probergrothius</i>	<i>sexpunctatus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Heteroptera	Scutelleridae	<i>Callidea</i>	<i>duodecimpunctata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Heteroptera	Tingidae	<i>Galeatus</i>	<i>scrophicus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Heteroptera	Tingidae	<i>Habrochila</i>	<i>kalahariana</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Homoptera	Aphididae	<i>Hyalopterus</i>	<i>pruni</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Homoptera	Cicadellidae	<i>Aconurella</i>	<i>compta</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Homoptera	Cicadellidae	<i>Austroagallia</i>	<i>cuneata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Homoptera	Cicadellidae	<i>Balclutha</i>	<i>hebe</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Homoptera	Cicadellidae	<i>Coloborrhis</i>	<i>corticina</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Homoptera	Cicadellidae	<i>Empoascanara</i>	<i>ethiopica</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Homoptera	Cicadellidae	<i>Exitianus</i>	<i>nanus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Homoptera	Cicadellidae	<i>Paradorydium</i>	<i>spatulum</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Homoptera	Cicadellidae	<i>Penthimia</i>	<i>vinula</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Homoptera	Cicadidae	<i>Munza</i>	<i>laticlavata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Homoptera	Cicadidae	<i>Platypleura</i>	<i>divisa</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Homoptera	Cicadidae	<i>Platypleura</i>	<i>fenestrata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Homoptera	Flatidae	<i>Cyada</i>	<i>truncata</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Homoptera	Flatidae	<i>Ulundia</i>	<i>decisa</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Homoptera	Issidae	<i>Hilda</i>	<i>patruelis</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Homoptera	Membracidae	<i>Oxyrachis</i>	<i>latipes</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Homoptera	Psyllidae	<i>Crastina</i>	<i>swakopensis</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Homoptera	Psyllidae	<i>Pauropsylla</i>	<i>longipes</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Homoptera	Triozidae	<i>Triozia</i>	<i>capensis</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Hymenoptera	Agaonidae	<i>Apocrypta</i>	<i>longitarsus</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Hymenoptera	Agaonidae	<i>Ceratosolen</i>	<i>arabicus</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Hymenoptera	Agaonidae	<i>Eukoebelea</i>	<i>sycamori</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Hymenoptera	Agaonidae	<i>Koebelea</i>	<i>gigas</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Hymenoptera	Agaonidae	<i>Sycophaga</i>	<i>sycomori</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident

Class	Order	Family	Genus	Species	NSS Biogeography	NSS Ecological range	NSS Status
Insecta	Hymenoptera	Anthophoridae	<i>Amegilla</i>	<i>niveata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Anthophoridae	<i>Amegilla</i>	<i>nivescens</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Anthophoridae	<i>Braunaspis</i>	<i>albipennis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Anthophoridae	<i>Tetraloniella</i>	<i>minuta</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Anthophoridae	<i>Xylocopa</i>	<i>caffra</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Anthophoridae	<i>Xylocopa</i>	<i>hottentotta</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Anthophoridae	<i>Xylocopa</i>	<i>lugubris</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Aphelinidae	<i>Azotus</i>	<i>capensis</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Hymenoptera	Aphelinidae	<i>Marietta</i>	<i>connecta</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Hymenoptera	Aphelinidae	<i>Marietta</i>	<i>javensis</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Hymenoptera	Aphelinidae	<i>Marietta</i>	<i>leopardina</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Hymenoptera	Apidae	<i>Apis</i>	<i>mellifera</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Chalcididae	<i>Hockeria</i>	<i>gallicola</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Hymenoptera	Chrysididae	<i>Chrysis</i>	<i>delicatula</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Chrysididae	<i>Chrysis</i>	<i>stilboides</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Chrysididae	<i>Hedychridium</i>	<i>fulgidum</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Chrysididae	<i>Stilbum</i>	<i>cyanurum amethystinum</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Colletidae	<i>Colletes</i>	<i>genalis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Colletidae	<i>Colletes</i>	<i>microdontus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Colletidae	<i>Colletes</i>	<i>ruficollis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Colletidae	<i>Colletes</i>	<i>testaceipes</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Dryinidae	<i>Bocchus</i>	<i>bini</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Hymenoptera	Dryinidae	<i>Gonatopus</i>	<i>johnsi</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Hymenoptera	Dryinidae	<i>Tridryinus</i>	<i>ampuliciformis</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Hymenoptera	Encyrtidae	<i>Adelencyrtus</i>	<i>inglisiae</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Hymenoptera	Encyrtidae	<i>Anagyrus</i>	<i>amnicus</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Hymenoptera	Encyrtidae	<i>Discodes</i>	<i>melas</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Hymenoptera	Encyrtidae	<i>Homalotylus</i>	<i>africanus</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Hymenoptera	Encyrtidae	<i>Homalotylus</i>	<i>flaminius</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Hymenoptera	Encyrtidae	<i>Mayridia</i>	<i>arida</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Hymenoptera	Encyrtidae	<i>Metaphycus</i>	<i>mineus</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Hymenoptera	Encyrtidae	<i>Prochiloneurus</i>	<i>aegyptiacus</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Hymenoptera	Encyrtidae	<i>Psyllaephagus</i>	<i>io</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Hymenoptera	Encyrtidae	<i>Psyllaephagus</i>	<i>vastus</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Hymenoptera	Eumenidae	<i>Eumenes</i>	<i>lepelltieri</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Hymenoptera	Eumenidae	<i>Eumenes</i>	<i>maxillosus</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Hymenoptera	Eumenidae	<i>Odynerus</i>	<i>gestroi</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident

Class	Order	Family	Genus	Species	NSS Biogeography	NSS Ecological range	NSS Status
Insecta	Hymenoptera	Eumenidae	<i>Odynerus</i>	<i>meyeri</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Hymenoptera	Eumenidae	<i>Rhynchium</i>	<i>marginellum</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Hymenoptera	Eumenidae	<i>Synagris</i>	<i>analis</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Hymenoptera	Eupelmidae	<i>Metapelma</i>	<i>riparia</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Hymenoptera	Fideliidae	<i>Fideliopsis</i>	<i>ornata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Fideliidae	<i>Parafidelia</i>	<i>pallidula</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Formicidae	<i>Anoplolepis</i>	<i>steingroeveri</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Hymenoptera	Formicidae	<i>Camponotus</i>	<i>fulvopilosus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Formicidae	<i>Cremastogaster</i>	<i>castanea</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Formicidae	<i>Messor</i>	<i>capensis</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Hymenoptera	Formicidae	<i>Messor</i>	<i>denticornis</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Hymenoptera	Formicidae	<i>Monomorium</i>	<i>alarum</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Hymenoptera	Formicidae	<i>Monomorium</i>	<i>drapenum</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Hymenoptera	Formicidae	<i>Monomorium</i>	<i>mantazenum</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Hymenoptera	Formicidae	<i>Monomorium</i>	<i>nirvanum</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Hymenoptera	Formicidae	<i>Monomorium</i>	<i>rufulum</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Hymenoptera	Formicidae	<i>Monomorium</i>	<i>vatranum</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Hymenoptera	Formicidae	<i>Monomorium</i>	<i>viator</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Hymenoptera	Formicidae	<i>Ocymyrmex</i>	<i>barbiger</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Hymenoptera	Formicidae	<i>Ocymyrmex</i>	<i>velox</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Hymenoptera	Formicidae	<i>Pheidole</i>	<i>tenuinodis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Formicidae	<i>Tetramorium</i>	<i>rufescens</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Hymenoptera	Formicidae	<i>Tetramorium</i>	<i>sericeiventre</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Hymenoptera	Formicidae	<i>Tetramorium</i>	<i>setuliferum</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Hymenoptera	Formicidae	<i>Tetraponera</i>	<i>ambigua</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Gasteruptiidae	<i>Gasteruption</i>	<i>ornatipes</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Hymenoptera	Halictidae	<i>Halictus</i>	<i>namaensis</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Hymenoptera	Halictidae	<i>Halictus</i>	<i>nitidiusculus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Megachilidae	<i>Anthidium</i>	<i>severini</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Megachilidae	<i>Chalicodoma</i>	<i>felina</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Megachilidae	<i>Megachile</i>	<i>wahlbergi</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Mutillidae	<i>Dasylabris</i>	<i>terpsichore</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Mutillidae	<i>Dasylabroides</i>	<i>latona</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Mutillidae	<i>Dolichomutilla</i>	<i>sykorax</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Mutillidae	<i>Stenomutilla</i>	<i>eurydice</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Mutillidae	<i>Strangulotilla</i>	<i>thoracosulcata damarana</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Platygasteridae	<i>Synopeas</i>	<i>bicolor</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident

Class	Order	Family	Genus	Species	NSS Biogeography	NSS Ecological range	NSS Status
Insecta	Hymenoptera	Platygasteridae	<i>Synopeas</i>	<i>nigerrimus</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Hymenoptera	Pompilidae	<i>Agenioideus</i>	<i>brevis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Pompilidae	<i>Agenioideus</i>	<i>decipiens</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Pompilidae	<i>Agenioideus</i>	<i>gibber</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Pompilidae	<i>Agenioideus</i>	<i>tripartitus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Pompilidae	<i>Agenioideus</i>	<i>varians</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Pompilidae	<i>Aporinellus</i>	<i>trifasciatus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Pompilidae	<i>Arachnotheutus</i>	<i>botswanus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Pompilidae	<i>Auplopus</i>	<i>ferrugineus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Pompilidae	<i>Ceropales</i>	<i>africana</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Pompilidae	<i>Ceropales</i>	<i>cribrata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Pompilidae	<i>Ceropales</i>	<i>karooensis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Pompilidae	<i>Ceropales</i>	<i>kriechbaumeri</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Pompilidae	<i>Ceropales</i>	<i>punctulata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Pompilidae	<i>Ceropales</i>	<i>waltoni</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Pompilidae	<i>Clavelia</i>	<i>decipiens</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Pompilidae	<i>Dicyrtomellus</i>	<i>rufofemoratus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Pompilidae	<i>Elaphrosyrus</i>	<i>insidiosus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Pompilidae	<i>Eoferreola</i>	<i>melanostoma</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Pompilidae	<i>Evagetes</i>	<i>argenteodecoratus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Pompilidae	<i>Hemipepsis</i>	<i>glabrata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Pompilidae	<i>Homonotus</i>	<i>dispersus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Pompilidae	<i>Paracyphononyx</i>	<i>tichriocephalus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Pompilidae	<i>Parapompilus</i>	<i>namana</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Pompilidae	<i>Pseudagenia</i>	<i>vaga</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Pompilidae	<i>Pseudoclavelia</i>	<i>damarensis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Pompilidae	<i>Pseudoclavelia</i>	<i>nitidula</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Pompilidae	<i>Schistonyx</i>	<i>atterimus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Pompilidae	<i>Schistonyx</i>	<i>sinuatus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Pompilidae	<i>Teinotrachelus</i>	<i>damarensis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Pteromalidae	<i>Catolaccus</i>	<i>crassiceps</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Hymenoptera	Scelionidae	<i>Breviscelio</i>	<i>crenatus</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Hymenoptera	Scelionidae	<i>Gryon</i>	<i>gnidus</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Hymenoptera	Scelionidae	<i>Gryon</i>	<i>saxatilis</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Hymenoptera	Scoliidae	<i>Scolia</i>	<i>betremi</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Sphecidae	<i>Ammophila</i>	<i>ferrugineipes</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Sphecidae	<i>Ampulex</i>	<i>denticollis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident

Class	Order	Family	Genus	Species	NSS Biogeography	NSS Ecological range	NSS Status
Insecta	Hymenoptera	Sphecidae	<i>Bembix</i>	<i>kriechbaumeri</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Sphecidae	<i>Bembix</i>	<i>liturata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Sphecidae	<i>Cerceris</i>	<i>albigena</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Sphecidae	<i>Cerceris</i>	<i>discrepans</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Sphecidae	<i>Cerceris</i>	<i>trichionota</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Sphecidae	<i>Cerceris</i>	<i>vulpecula</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Sphecidae	<i>Gastrosericus</i>	<i>chalcithorax</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Hymenoptera	Sphecidae	<i>Gastrosericus</i>	<i>karooensis</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Hymenoptera	Sphecidae	<i>Gastrosericus</i>	<i>nama</i>	d. Bounding	i. Dune Sea specialist	07. Interdigitated resident
Insecta	Hymenoptera	Sphecidae	<i>Gastrosericus</i>	<i>neavei</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Sphecidae	<i>Gastrosericus</i>	<i>pulchellus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Sphecidae	<i>Gastrosericus</i>	<i>tuberculatus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Sphecidae	<i>Gastrosericus</i>	<i>waltlii</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Sphecidae	<i>Gastrosericus</i>	<i>xanthophilus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Sphecidae	<i>Holotachysphex</i>	<i>turneri</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Sphecidae	<i>Karossia</i>	<i>hessei</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Sphecidae	<i>Miscophus</i>	<i>karrooensis</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Hymenoptera	Sphecidae	<i>Miscophus</i>	<i>oraniensis</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Hymenoptera	Sphecidae	<i>Namiscophus</i>	<i>namaquensis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Sphecidae	<i>Odontosphex</i>	<i>damara</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Sphecidae	<i>Oxybelus</i>	<i>hessei</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Sphecidae	<i>Palarus</i>	<i>handlirschi</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Sphecidae	<i>Parapsammophila</i>	<i>herero</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Sphecidae	<i>Saliostethus</i>	<i>flavomaculatus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Sphecidae	<i>Saliostethus</i>	<i>fuscifrons</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Sphecidae	<i>Saliostethus</i>	<i>ungulatus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Sphecidae	<i>Saliostethus</i>	<i>xanthomaculatus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Sphecidae	<i>Solierella</i>	<i>rhodesiana</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Sphecidae	<i>Solierella</i>	<i>scrobiculata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Sphecidae	<i>Tachysphex</i>	<i>aethiopicus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Sphecidae	<i>Tachysphex</i>	<i>kalaharicus</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Hymenoptera	Sphecidae	<i>Tachysphex</i>	<i>prosopigastroides</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Sphecidae	<i>Tachytella</i>	<i>nama</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Vespidae	<i>Belonogaster</i>	<i>lateritius</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Vespidae	<i>Delta</i>	<i>lepeleterii</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Vespidae	<i>Polistes</i>	<i>smithii</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Hymenoptera	Vespidae	<i>Tricarindynerus</i>	<i>guerinii</i>	d. Bounding	iv. Generalist	07. Interdigitated resident

Class	Order	Family	Genus	Species	NSS Biogeography	NSS Ecological range	NSS Status
Insecta	Lepidoptera	Arctiidae	<i>Cymaroa</i>	<i>grisea</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Arctiidae	<i>Micralarctia</i>	<i>australis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Arctiidae	<i>Paramaenas</i>	<i>strigosus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Arctiidae	<i>Utetheisa</i>	<i>pulchella</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Choreutidae	<i>Choreutis</i>	<i>aegyptica</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Choreutidae	<i>Tebenna</i>	<i>micalis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Chrysopeleiididae	<i>Ascalenia</i>	<i>melanogastra</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Chrysopeleiididae	<i>Giselia</i>	<i>stagnans</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Coleophoridae	<i>Coleophora</i>	<i>kruegeri</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Coleophoridae	<i>Coleophora</i>	<i>namibiae</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Copromorphidae	<i>Rhynchophorella</i>	<i>syncentra</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Cosmopterygidae	<i>Cosmopterix</i>	<i>attenuatella</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Cosmopterygidae	<i>Macrobathra</i>	<i>fasciata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Cossidae	<i>Arctiocossus</i>	<i>gaerdesi</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Cossidae	<i>Arctiocossus</i>	<i>poliopterus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Cossidae	<i>Brachylia</i>	<i>eutelia</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Crambidae	<i>Achyra</i>	<i>coelatalis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Crambidae	<i>Achyra</i>	<i>nudalis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Crambidae	<i>Antigastra</i>	<i>catalaunalis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Crambidae	<i>Euchromius</i>	<i>discopis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Crambidae	<i>Euchromius</i>	<i>ocelleus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Crambidae	<i>Loxostege</i>	<i>frustalis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Crambidae	<i>Maruca</i>	<i>vitrata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Crambidae	<i>Nomophila</i>	<i>noctuella</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Crambidae	<i>Noordia</i>	<i>blitealis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Crambidae	<i>Pediasia</i>	<i>ematheudelia</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Crambidae	<i>Pseudonoorda</i>	<i>rubricostalis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Crambidae	<i>Spoladea</i>	<i>recurvalis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Crambidae	<i>Tegostoma</i>	<i>comparalis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Crambidae	<i>Tegostoma</i>	<i>subterminalis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Crambidae	<i>Uresiphita</i>	<i>polygonalis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Ethmiidae	<i>Ethmia</i>	<i>oculigera</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Galactiidae	<i>Homodaula</i>	<i>albida</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Gelechiidae	<i>Acutitornus</i>	<i>munda</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Gelechiidae	<i>Anarsia</i>	<i>agricola</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Gelechiidae	<i>Anarsia</i>	<i>nimbosa</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Gelechiidae	<i>Argophara</i>	<i>epaxia</i>	d. Bounding	iv. Generalist	07. Interdigitated resident

Class	Order	Family	Genus	Species	NSS Biogeography	NSS Ecological range	NSS Status
Insecta	Lepidoptera	Gelechiidae	<i>Aspades</i>	<i>hutchinsonella</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Gelechiidae	<i>Ergasiola</i>	<i>ergasima</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Gelechiidae	<i>Grandipalpa</i>	<i>robusta</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Gelechiidae	<i>Hedma</i>	<i>microcasis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Gelechiidae	<i>Hypotima</i>	<i>austerodes</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Gelechiidae	<i>Lacistodes</i>	<i>tauropis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Gelechiidae	<i>Microcraspedus</i>	<i>synecta</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Gelechiidae	<i>Neotelphusa</i>	<i>ochlerodes</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Gelechiidae	<i>Ochrodia</i>	<i>pentamaculata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Gelechiidae	<i>Octonodula</i>	<i>binotella</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Gelechiidae	<i>Ornativa</i>	<i>kalahariensis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Gelechiidae	<i>Paratelfusa</i>	<i>reducta</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Gelechiidae	<i>Paratlectis</i>	<i>sordidula</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Gelechiidae	<i>Polyhymno</i>	<i>chionarcha</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Gelechiidae	<i>Polyhymno</i>	<i>hostilis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Gelechiidae	<i>Polyhymno</i>	<i>pausimacha</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Gelechiidae	<i>Scrobipalpa</i>	<i>diversa</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Gelechiidae	<i>Scrobipalpa</i>	<i>vicaria</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Gelechiidae	<i>Streyella</i>	<i>pallidigrisea</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Gelechiidae	<i>Syncopacma</i>	<i>oxispila</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Gelechiidae	<i>Syncopacma</i>	<i>polychromella</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Geometridae	<i>Chiasmia</i>	<i>multistrigata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Geometridae	<i>Chiasmia</i>	<i>tecnium</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Geometridae	<i>Conchyloides</i>	<i>distelitis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Geometridae	<i>Drepanogynis</i>	<i>incondita</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Geometridae	<i>Holoterpna</i>	<i>errata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Geometridae	<i>Idaea</i>	<i>fumilinea</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Geometridae	<i>Isturgia</i>	<i>deeraria</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Geometridae	<i>Mictoschema</i>	<i>tuckeri</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Geometridae	<i>Neromia</i>	<i>strigulosa</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Geometridae	<i>Rhodometra</i>	<i>sacraria</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Geometridae	<i>Scopula</i>	<i>palleuca</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Gracillariidae	<i>Callicercops</i>	<i>tricerops</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Gracillariidae	<i>Caloptilia</i>	<i>isotoma</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Gracillariidae	<i>Caloptilia</i>	<i>pentaplaca</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Gracillariidae	<i>Conopobathra</i>	<i>carbunculata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Gracillariidae	<i>Conopobathra</i>	<i>plethorhabda</i>	d. Bounding	iv. Generalist	07. Interdigitated resident

Class	Order	Family	Genus	Species	NSS Biogeography	NSS Ecological range	NSS Status
Insecta	Lepidoptera	Gracillariidae	<i>Cuphodes</i>	<i>melanostola</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Gracillariidae	<i>Phyllonorycter</i>	<i>chionopa</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Gracillariidae	<i>Stomphastis</i>	<i>cardamitis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Gracillariidae	<i>Stomphastis</i>	<i>crotonis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Hesperiidae	<i>Gomalia</i>	<i>elma</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Hesperiidae	<i>Spialia</i>	<i>colotes transvaaliae</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Lasiocampidae	<i>Gonometa</i>	<i>postica</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Lasiocampidae	<i>Schausinna</i>	<i>regia</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Lasiocampidae	<i>Sena</i>	<i>parva</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Lasiocampidae	<i>Sena</i>	<i>prompta</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Lecithoceridae	<i>Dragmatucha</i>	<i>proaula</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Limacodidae	<i>Coenobasis</i>	<i>argentina</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Limacodidae	<i>Isozinara</i>	<i>pallidifascia</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Limacodidae	<i>Taeda</i>	<i>aetitis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Lycaenidae	<i>Anthene</i>	<i>amarah</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Lycaenidae	<i>Azanus</i>	<i>jesous</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Lycaenidae	<i>Azanus</i>	<i>natalensis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Lycaenidae	<i>Brephidium</i>	<i>metophis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Lycaenidae	<i>Deudorix</i>	<i>antalus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Lycaenidae	<i>Freyeria</i>	<i>trochylus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Lycaenidae	<i>Iolaus</i>	<i>subinfuscata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Lycaenidae	<i>Lampides</i>	<i>boeticus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Lycaenidae	<i>Myrina</i>	<i>silenus suzannae</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Lycaenidae	<i>Tarucus</i>	<i>sybaris linearis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Lycaenidae	<i>Tylopaedia</i>	<i>sardonix</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Lycaenidae	<i>Zintha</i>	<i>hintza</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Lymantriidae	<i>Crorema</i>	<i>nigropunctata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Lymantriidae	<i>Laelia</i>	<i>actiosa</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Lymantriidae	<i>Laelioproctis</i>	<i>leucosphena</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Lymantriidae	<i>Tearosoma</i>	<i>aspersum</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Nepticulidae	<i>Ectoedemia</i>	<i>fuscata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Nepticulidae	<i>Ectoedemia</i>	<i>vannifera</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Nepticulidae	<i>Stigmella</i>	<i>irrorata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Noctuidae	<i>Acantholipes</i>	<i>trimeni</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Noctuidae	<i>Achaea</i>	<i>catella</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Noctuidae	<i>Acontia</i>	<i>antica</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Noctuidae	<i>Acontia</i>	<i>conifrons</i>	d. Bounding	iv. Generalist	07. Interdigitated resident

Class	Order	Family	Genus	Species	NSS Biogeography	NSS Ecological range	NSS Status
Insecta	Lepidoptera	Noctuidae	<i>Acontia</i>	<i>guttifera</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Noctuidae	<i>Acontia</i>	<i>trimaculata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Noctuidae	<i>Adisuro</i>	<i>aerugo</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Noctuidae	<i>Agrotis</i>	<i>ipilon</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Noctuidae	<i>Agrotis</i>	<i>segetum</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Noctuidae	<i>Amyna</i>	<i>punctum</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Noctuidae	<i>Annua</i>	<i>umbrillinea</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Noctuidae	<i>Anomis</i>	<i>sabulifera</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Noctuidae	<i>Asplenia</i>	<i>melanodonta</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Noctuidae	<i>Audea</i>	<i>melanoplaga</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Noctuidae	<i>Bananiana</i>	<i>culminifera</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Noctuidae	<i>Cardepi</i>	<i>definiens</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Noctuidae	<i>Ctenusa</i>	<i>pallida</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Noctuidae	<i>Cucullia</i>	<i>inequalis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Noctuidae	<i>Cucullia</i>	<i>terrensis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Noctuidae	<i>Diaphone</i>	<i>eumela</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Noctuidae	<i>Ectoche</i>	<i>nigrilineata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Noctuidae	<i>Eublemma</i>	<i>admota</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Noctuidae	<i>Eublemma</i>	<i>griseofimbriata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Noctuidae	<i>Eublemma</i>	<i>odontophora</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Noctuidae	<i>Eutelia</i>	<i>polychorda</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Noctuidae	<i>Helicoverpa</i>	<i>armigera</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Noctuidae	<i>Heliothis</i>	<i>gallathea</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Noctuidae	<i>Heliothis</i>	<i>scutuligera</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Noctuidae	<i>Hypocala</i>	<i>rostrata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Noctuidae	<i>lamba</i>	<i>inferalis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Noctuidae	<i>lamboides</i>	<i>incerta</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Noctuidae	<i>Leucania</i>	<i>pseudoloreyi</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Noctuidae	<i>Ozarba</i>	<i>bicoloria</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Noctuidae	<i>Ozarba</i>	<i>heliasthes</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Noctuidae	<i>Ozarba</i>	<i>hypoxantha</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Noctuidae	<i>Ozarba</i>	<i>sinua</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Noctuidae	<i>Pandesma</i>	<i>robusta</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Noctuidae	<i>Pericyma</i>	<i>atrifusa</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Noctuidae	<i>Prodotis</i>	<i>stolida</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Noctuidae	<i>Pseudozarba</i>	<i>orthozona</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Noctuidae	<i>Rhaguva</i>	<i>stigmatia</i>	d. Bounding	iv. Generalist	07. Interdigitated resident

Class	Order	Family	Genus	Species	NSS Biogeography	NSS Ecological range	NSS Status
Insecta	Lepidoptera	Noctuidae	<i>Rhesala</i>	<i>moestalis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Noctuidae	<i>Sphingomorpha</i>	<i>chlorea</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Noctuidae	<i>Spodoptera</i>	<i>exigua</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Noctuidae	<i>Trichoplusia</i>	<i>exquisita</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Noctuidae	<i>Ulotrichopus</i>	<i>tinctipennis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Noctuidae	<i>Xanthodes</i>	<i>brunnescens</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Nymphalidae	<i>Acraea</i>	<i>neobule</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Nymphalidae	<i>Byblia</i>	<i>ilithyia</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Nymphalidae	<i>Charaxes</i>	<i>jasius saturnus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Nymphalidae	<i>Cynthia</i>	<i>cardui</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Nymphalidae	<i>Danaus</i>	<i>chrysippus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Nymphalidae	<i>Hamanumida</i>	<i>daedalus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Nymphalidae	<i>Hypolimnas</i>	<i>missippus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Nymphalidae	<i>Physcaeneura</i>	<i>panda</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Nymphalidae	<i>Precis</i>	<i>hierta cebrene</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Nymphalidae	<i>Stygionympha</i>	<i>irrorata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Nymphalidae	<i>Stygionympha</i>	<i>robertsoni</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Nymphalidae	<i>Ypthima</i>	<i>asterope hereroica</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Papilionidae	<i>Papilio</i>	<i>demodocus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Pieridae	<i>Belenois</i>	<i>aurota</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Pieridae	<i>Belenois</i>	<i>creona severina</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Pieridae	<i>Catopsilia</i>	<i>florella</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Pieridae	<i>Colotis</i>	<i>agoye bowkeri</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Pieridae	<i>Colotis</i>	<i>amata williami</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Pieridae	<i>Colotis</i>	<i>antevippe gavis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Pieridae	<i>Colotis</i>	<i>celimene pholoe</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Pieridae	<i>Colotis</i>	<i>danae walkeri</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Pieridae	<i>Colotis</i>	<i>evagore antigone</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Pieridae	<i>Colotis</i>	<i>evenina</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Pieridae	<i>Colotis</i>	<i>lais</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Pieridae	<i>Colotis</i>	<i>regina</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Pieridae	<i>Eurema</i>	<i>brigitta</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Pieridae	<i>Nepheronia</i>	<i>buquetii</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Pieridae	<i>Pinacopteryx</i>	<i>eriphia</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Pieridae	<i>Pontia</i>	<i>helice</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Plutellidae	<i>Plutella</i>	<i>xylostella</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Psychidae	<i>Kotochalia</i>	<i>junodi</i>	d. Bounding	iv. Generalist	07. Interdigitated resident

Class	Order	Family	Genus	Species	NSS Biogeography	NSS Ecological range	NSS Status
Insecta	Lepidoptera	Pterophoridae	<i>Agdistis</i>	<i>clara</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Pterophoridae	<i>Agdistis</i>	<i>spinosa</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Pyralidae	<i>Abachausia</i>	<i>grisea</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Pyralidae	<i>Acrobasis</i>	<i>africanella</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Pyralidae	<i>Aglossa</i>	<i>rhodalis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Pyralidae	<i>Anacylothis</i>	<i>interjectella</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Pyralidae	<i>Anacylothis</i>	<i>namibiella</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Pyralidae	<i>Arsissa</i>	<i>transvaalica</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Pyralidae	<i>Cadra</i>	<i>figulilella</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Pyralidae	<i>Canthelea</i>	<i>nigrinella</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Pyralidae	<i>Ceutilophia</i>	<i>isidis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Pyralidae	<i>Etiella</i>	<i>zinckenella</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Pyralidae	<i>Hypargyria</i>	<i>metalliferella</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Pyralidae	<i>Hypotia</i>	<i>dinteri</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Saturniidae	<i>Goodia</i>	<i>kuntzei</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Saturniidae	<i>Gyanisa</i>	<i>maja</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Saturniidae	<i>Heniocha</i>	<i>dyops</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Saturniidae	<i>Ludia</i>	<i>delegorguei</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Scythridae	<i>Scythris</i>	<i>inota</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Sphingidae	<i>Acherontia</i>	<i>atropos</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Sphingidae	<i>Agrius</i>	<i>convolvuli</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Sphingidae	<i>Cephonodes</i>	<i>hylas virescens</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Sphingidae	<i>Deilephila</i>	<i>nerii</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Sphingidae	<i>Hippotion</i>	<i>rosae</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Sphingidae	<i>Hoplistopus</i>	<i>penricae</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Sphingidae	<i>Nephele</i>	<i>comma</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Sphingidae	<i>Polypitchoides</i>	<i>grayi assimilis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Sphingidae	<i>Rufoclanis</i>	<i>numosae</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Tischeriidae	<i>Coptotriche</i>	<i>africana</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Tischeriidae	<i>Tischeria</i>	<i>antilope</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Lepidoptera	Yponomeutidae	<i>Yponomeuta</i>	<i>subplumbella</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Mantodea	Amorphoscelididae	<i>Amorphoscelis</i>	<i>austrogermanica</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Mantodea	Empusidae	<i>Hemiempusa</i>	<i>capensis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Mantodea	Iridopterygidae	<i>Tarachina</i>	<i>australis</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Mantodea	Iridopterygidae	<i>Tarachina</i>	<i>raphidioides</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Mantodea	Mantidae	<i>Galepsus</i>	<i>aberrans</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Mantodea	Mantidae	<i>Galepsus</i>	<i>ulricae</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident

Class	Order	Family	Genus	Species	NSS Biogeography	NSS Ecological range	NSS Status
Insecta	Mantodea	Mantidae	<i>Geothespis</i>	<i>australis</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Mantodea	Mantidae	<i>Ligariella</i>	<i>australis</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Mantodea	Mantidae	<i>Ligentella</i>	<i>beieri</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Mantodea	Mantidae	<i>Mantis</i>	<i>religiosa</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Mantodea	Mantidae	<i>Pseudodystacta</i>	<i>braueri</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Mantodea	Mantidae	<i>Sphodromantis</i>	<i>gastrica</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Mantodea	Mantidae	<i>Sphodromantis</i>	<i>occidentalis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Mantodea	Mantidae	<i>Tarachodes</i>	<i>lucubrans</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Neuroptera	Chrysopidae	<i>Brinckochrysa</i>	<i>michaelseni</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Neuroptera	Chrysopidae	<i>Brinckochrysa</i>	<i>turkanensis</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Neuroptera	Chrysopidae	<i>Chrysemosa</i>	<i>jeanneli</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Neuroptera	Chrysopidae	<i>Chrysoperla</i>	<i>zastrowi</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Neuroptera	Chrysopidae	<i>Dichochrysa</i>	<i>tacta</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Neuroptera	Chrysopidae	<i>Italochrysa</i>	<i>vansoni</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Neuroptera	Coniopterygidae	<i>Coniopteryx</i>	<i>stuckenbergi</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Neuroptera	Coniopterygidae	<i>Hemisemidalis</i>	<i>barnardi</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Neuroptera	Coniopterygidae	<i>Hemisemidalis</i>	<i>longipennis</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Neuroptera	Coniopterygidae	<i>Semidalis</i>	<i>fuelleborni</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Neuroptera	Myrmeleontidae	<i>Centroclisis</i>	<i>brachygaster</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Neuroptera	Myrmeleontidae	<i>Creoleon</i>	<i>africanus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Neuroptera	Myrmeleontidae	<i>Myrmeleon</i>	<i>alcestris</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Neuroptera	Myrmeleontidae	<i>Myrmeleon</i>	<i>obscurus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Neuroptera	Myrmeleontidae	<i>Myrmeleon</i>	<i>pallescens</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Neuroptera	Myrmeleontidae	<i>Palparellus</i>	<i>damariensis</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Neuroptera	Myrmeleontidae	<i>Palparellus</i>	<i>flavofasciatus</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Neuroptera	Myrmeleontidae	<i>Palpares</i>	<i>immensus</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Neuroptera	Myrmeleontidae	<i>Palparidius</i>	<i>capicola</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Neuroptera	Nemopteridae	<i>Thysanocroce</i>	<i>damarae</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Neuroptera	Psychopsidae	<i>Silveira</i>	<i>jordani</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Odonata	Libellulidae	<i>Crocothemis</i>	<i>erythraea</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Odonata	Libellulidae	<i>Sympetrum</i>	<i>fonscolombei</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Odonata	Libellulidae	<i>Trithemis</i>	<i>kirbyi</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Orthoptera	Acrididae	<i>Anabiba</i>	<i>thoracica</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Orthoptera	Acrididae	<i>Anacridium</i>	<i>moestum</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Orthoptera	Acrididae	<i>Brownacris</i>	<i>haackei</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Orthoptera	Acrididae	<i>Cataloipus</i>	<i>ambiguus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Orthoptera	Acrididae	<i>Catantops</i>	<i>melanostictus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident

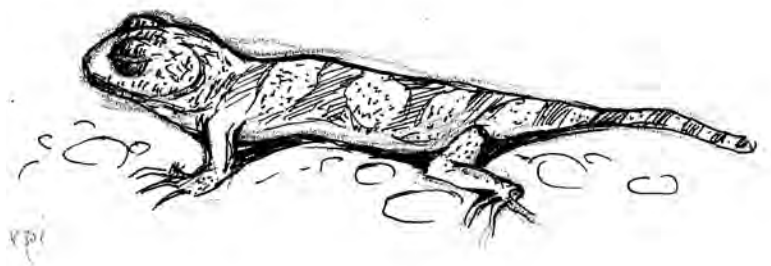
Class	Order	Family	Genus	Species	NSS Biogeography	NSS Ecological range	NSS Status
Insecta	Orthoptera	Acrididae	<i>Cyrtacanthacris</i>	<i>tatarica</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Orthoptera	Acrididae	<i>Damacris</i>	<i>rupestris</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Orthoptera	Acrididae	<i>Euryphemus</i>	<i>eremobioides</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Orthoptera	Acrididae	<i>Humbe</i>	<i>tenuicornis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Orthoptera	Acrididae	<i>Lithidium</i>	<i>buschmanicum</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Orthoptera	Acrididae	<i>Oedaleus</i>	<i>flavus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Orthoptera	Acrididae	<i>Ornithacris</i>	<i>ruficornis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Orthoptera	Acrididae	<i>Plegmapterus</i>	<i>splendens</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Orthoptera	Acrididae	<i>Scintharista</i>	<i>magnifica</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Orthoptera	Acrididae	<i>Truxaloides</i>	<i>serratus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Orthoptera	Acrididae	<i>Xenocymochtha</i>	<i>barkeri</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Orthoptera	Bradyporidae	<i>Acanthoplus</i>	<i>longipes</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Orthoptera	Bradyporidae	<i>Acanthoproctus</i>	<i>cervinus</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Orthoptera	Charilaidae	<i>Hemicharilaus</i>	<i>monomorphus</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Orthoptera	Euschmidtidae	<i>Lophothericles</i>	<i>flavifrons</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Orthoptera	Gryllidae	<i>Gryllus</i>	<i>zaisi</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Orthoptera	Lentulidae	<i>Devylideria</i>	<i>coryphistoides</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Orthoptera	Pamphagidae	<i>Echinotropis</i>	<i>karasensis</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Orthoptera	Pamphagidae	<i>Hoplolopha</i>	<i>karasensis</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Orthoptera	Pamphagidae	<i>Lamarkiana</i>	<i>arenosa</i>	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Insecta	Orthoptera	Pamphagidae	<i>Lamarkiana</i>	<i>sparrmani</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Orthoptera	Pyrgomorphidae	<i>Phymateus</i>	<i>viridipes</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Orthoptera	Pyrgomorphidae	<i>Pyrgomorpha</i>	<i>conica</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Orthoptera	Pyrgomorphidae	<i>Zonocerus</i>	<i>elegans</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Orthoptera	Tettigoniidae	<i>Clonia</i>	<i>wahlbergi</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Orthoptera	Tettigoniidae	<i>Plangia</i>	<i>graminea</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Orthoptera	Tettigoniidae	<i>Pseudosaga</i>	<i>maculata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Orthoptera	Tettigoniidae	<i>Ruspolia</i>	<i>differens</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Orthoptera	Tridactylidae	<i>Xya</i>	<i>maraisi</i>	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Insecta	Phasmatodea	Phasmidae	<i>Bactrododema</i>	<i>brevicornis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Phasmatodea	Phasmidae	<i>Bactrododema</i>	<i>tiarata</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Thysanoptera	Phlaeothripidae	<i>Dolicholepta</i>	<i>karneyi</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Thysanoptera	Phlaeothripidae	<i>Haplothrips</i>	<i>nigricornis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Thysanoptera	Phlaeothripidae	<i>Haplothrips</i>	<i>tardus</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Thysanoptera	Thripidae	<i>Agerothrips</i>	<i>bodius</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Trichoptera	Dipseudopsidae	<i>Dipseudopsis</i>	<i>capensis</i>	d. Bounding	iv. Generalist	07. Interdigitated resident
Insecta	Orthoptera	Tridactylidae	<i>Afrotridactylus</i>	<i>meridianus</i>	e. Sandwich	iii. Habitat specialist	07. Interdigitated resident

Class	Order	Family	Genus	Species	NSS Biogeography	NSS Ecological range	NSS Status
Insecta	Coleoptera	Buprestidae	<i>Acmaeodera</i>	<i>albovillosa</i>	d. Bounding	iv. Generalist	08. Marginal presence
Insecta	Coleoptera	Buprestidae	<i>Acmaeodera</i>	<i>deplanata</i>	d. Bounding	iv. Generalist	08. Marginal presence
Insecta	Coleoptera	Buprestidae	<i>Acmaeodera</i>	<i>lugubrina</i>	d. Bounding	iv. Generalist	08. Marginal presence
Insecta	Coleoptera	Buprestidae	<i>Acmaeodera</i>	<i>signifera</i>	d. Bounding	iv. Generalist	08. Marginal presence
Insecta	Coleoptera	Buprestidae	<i>Julodis</i>	<i>bennigseni</i>	d. Bounding	iv. Generalist	08. Marginal presence
Insecta	Coleoptera	Buprestidae	<i>Julodis</i>	<i>desertica</i>	d. Bounding	iv. Generalist	08. Marginal presence
Insecta	Coleoptera	Buprestidae	<i>Neojulodis</i>	<i>vittipennis</i>	d. Bounding	iv. Generalist	08. Marginal presence
Insecta	Coleoptera	Buprestidae	<i>Sternocera</i>	<i>orissa</i>	d. Bounding	iv. Generalist	08. Marginal presence
Insecta	Coleoptera	Cerambycidae	<i>Coelodon</i>	<i>servum</i>	d. Bounding	iv. Generalist	08. Marginal presence
Insecta	Coleoptera	Cerambycidae	<i>Docoahammus</i>	<i>bennigseni</i>	d. Bounding	iv. Generalist	08. Marginal presence
Insecta	Coleoptera	Cerambycidae	<i>Eugoides</i>	<i>kolbei</i>	d. Bounding	iv. Generalist	08. Marginal presence
Insecta	Coleoptera	Cerambycidae	<i>Exocentrus</i>	<i>echinulus</i>	d. Bounding	iv. Generalist	08. Marginal presence
Insecta	Coleoptera	Cerambycidae	<i>Frea</i>	<i>circumscripta</i>	d. Bounding	iv. Generalist	08. Marginal presence
Insecta	Coleoptera	Cerambycidae	<i>Oberea</i>	<i>trigonalis</i>	d. Bounding	iv. Generalist	08. Marginal presence
Insecta	Coleoptera	Cerambycidae	<i>Parhecyra</i>	<i>costata</i>	d. Bounding	iv. Generalist	08. Marginal presence
Insecta	Coleoptera	Cerambycidae	<i>Phyllocnema</i>	<i>mirifica</i>	d. Bounding	iv. Generalist	08. Marginal presence
Insecta	Coleoptera	Cerambycidae	<i>Prospilus</i>	<i>vansonii</i>	d. Bounding	iv. Generalist	08. Marginal presence
Insecta	Coleoptera	Cerambycidae	<i>Titocerus</i>	<i>jaspideus</i>	d. Bounding	iv. Generalist	08. Marginal presence
Insecta	Coleoptera	Passalidae	<i>Hectarthrum</i>	<i>simplex</i>	d. Bounding	iv. Generalist	08. Marginal presence
Insecta	Coleoptera	Ptinidae	<i>Stethomezium</i>	<i>nooitgedag</i>	d. Bounding	iv. Generalist	08. Marginal presence
Insecta	Coleoptera	Tenebrionidae	<i>Cauricara</i>	<i>velox</i>	d. Bounding	iv. Generalist	08. Marginal presence
Insecta	Coleoptera	Tenebrionidae	<i>Cryptochile</i>	<i>consita</i>	d. Bounding	iv. Generalist	08. Marginal presence
Insecta	Coleoptera	Tenebrionidae	<i>Epiphysa</i>	<i>punctatissima</i>	d. Bounding	iv. Generalist	08. Marginal presence
Insecta	Coleoptera	Tenebrionidae	<i>Physadesmia</i>	<i>bullata</i>	d. Bounding	ii. Arid area specialist	08. Marginal presence
Insecta	Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>amabilis</i>	d. Bounding	ii. Arid area specialist	08. Marginal presence
Insecta	Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>amita</i>	d. Bounding	ii. Arid area specialist	08. Marginal presence
Insecta	Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>balti</i>	d. Bounding	ii. Arid area specialist	08. Marginal presence
Insecta	Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>castelnaudi</i>	d. Bounding	ii. Arid area specialist	08. Marginal presence
Insecta	Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>cerea</i>	d. Bounding	ii. Arid area specialist	08. Marginal presence
Insecta	Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>damarina</i>	d. Bounding	ii. Arid area specialist	08. Marginal presence
Insecta	Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>devexa</i>	d. Bounding	ii. Arid area specialist	08. Marginal presence
Insecta	Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>dorsata</i>	d. Bounding	ii. Arid area specialist	08. Marginal presence
Insecta	Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>fulgens</i>	d. Bounding	ii. Arid area specialist	08. Marginal presence
Insecta	Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>infanda</i>	d. Bounding	ii. Arid area specialist	08. Marginal presence
Insecta	Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>kochi</i>	d. Bounding	ii. Arid area specialist	08. Marginal presence
Insecta	Odonata	Lestidae	<i>Lestes</i>	<i>pallidus</i>	a. Sand Sea	i. Dune Sea specialist	09. Common migrant
Insecta	Odonata	Gomphidae	<i>Paragomphus</i>	<i>genei</i>	c. Widespread	iii. Habitat specialist	09. Common migrant

Class	Order	Family	Genus	Species	NSS Biogeography	NSS Ecological range	NSS Status
Insecta	Coleoptera	Buprestidae	<i>Julodis</i>	<i>anthobia</i>	d. Bounding	iv. Generalist	09. Common migrant
Insecta	Odonata	Aeschnidae	<i>Anax</i>	<i>imperator</i>	d. Bounding	iii. Habitat specialist	09. Common migrant
Insecta	Odonata	Libellulidae	<i>Crocothemis</i>	<i>sanguinolenta</i>	d. Bounding	iii. Habitat specialist	09. Common migrant
Insecta	Odonata	Libellulidae	<i>Diplacodes</i>	<i>lefebvrei</i>	d. Bounding	iii. Habitat specialist	09. Common migrant
Insecta	Odonata	Libellulidae	<i>Orthetrum</i>	<i>chrysostigma</i>	d. Bounding	iii. Habitat specialist	09. Common migrant
Insecta	Odonata	Libellulidae	<i>Orthetrum</i>	<i>trinacria</i>	d. Bounding	iii. Habitat specialist	09. Common migrant
Insecta	Odonata	Libellulidae	<i>Pantala</i>	<i>flavescens</i>	d. Bounding	iv. Generalist	09. Common migrant
Insecta	Orthoptera	Gryllidae	<i>Brachytrupes</i>	<i>membranaceus</i>	d. Bounding	iv. Generalist	09. Common migrant
Insecta	Odonata	Aeschnidae	<i>Anax</i>	<i>ephippiger</i>	d. Bounding	iii. Habitat specialist	10. Intermittent visitor
Insecta	Odonata	Libellulidae	<i>Diplacodes</i>	<i>luminans</i>	d. Bounding	iii. Habitat specialist	10. Intermittent visitor
Insecta	Odonata	Libellulidae	<i>Tholymis</i>	<i>tillarga</i>	d. Bounding	iii. Habitat specialist	10. Intermittent visitor
Insecta	Odonata	Libellulidae	<i>Trithemis</i>	<i>arteriosa</i>	d. Bounding	iii. Habitat specialist	10. Intermittent visitor
Insecta	Thysanura	Lepismatidae	<i>Ctenolepisma</i>	<i>longicaudata</i>	c. Widespread	iv. Generalist	12. Alien
Insecta	Blattodea	Blatellidae	<i>Blatella</i>	<i>germanica</i>	d. Bounding	iv. Generalist	12. Alien
Insecta	Coleoptera	Cerambycidae	<i>Arhopalus</i>	<i>ferus</i>	d. Bounding	iv. Generalist	12. Alien
Insecta	Coleoptera	Ptinidae	<i>Stethomezium</i>	<i>squamosum</i>	d. Bounding	iv. Generalist	12. Alien
Insecta	Orthoptera	Gryllidae	<i>Acheta</i>	<i>domestica</i>	d. Bounding	iv. Generalist	12. Alien
Insecta	Orthoptera	Gryllidae	<i>Gryllus</i>	<i>bimaculatus</i>	d. Bounding	iv. Generalist	12. Alien
Insecta	Phthiraptera	Pthiridae	<i>Pthirus</i>	<i>pubis</i>	d. Bounding	iii. Habitat specialist	12. Alien
Insecta	Siphonaptera	Pulicidae	<i>Pulex</i>	<i>irritans</i>	d. Bounding	iii. Habitat specialist	12. Alien

Annex 14

Table of Fish, Amphibians & Reptiles



Namib Sand Sea Biogeography Biogeography description

- a. Sand Sea Sand Sea inhabitants rarely ranging outside dune habitats
- b. Inselbergs Petrophilous inselberg inhabitants occurring as isolated populations within the Sand Sea
- c. Widespread May inhabit any part of the property due to vagility and catholic ecological choice
- d. Boundinging Mostly found adjacent to the Sand Sea and contributing to biodiversity and ecology through suitable habitat inside the property, marginally intruding or absent from dunes
- e. Sandwich Ramsar Specific Sandwich Harbour Ramsar site inhabitants

Ecological range

- i. Dune Sea specialist
- ii. Arid area specialist
- iii. Habitat specialist
- iv. Generalist

Ecological range description

- Psammophilous species restricted to Namib Biome sand dunes
- Euryaceous species restricted to arid biome habitats
- Stenotypic species, habitat, host or prey specific
- Not habitat specific with wide ecological choice

Status

- 01. Strict Endemic
- 02. Dune Endemic
- 03. Near Endemic
- 04. Common Resident
- 05. Rare Resident
- 06. Relict
- 07. Interdigitated resident
- 08. Marginal presence
- 09. Common migrant
- 10. Intermittent visitor
- 11. Vagrant
- 12. Alien
- 13. Domesticated

Status Description

- Psammophilous species only found in Namib Sand Sea
- Psammophilous species in Namib Sand Sea, range extend to outhur Namib Biome dune areas
- Restricted to Namib Biomes
- Common throughout Namib Sand Sea property
- Rarely recorded from Namib Sand Sea property, not unexpected
- Isolated healthy populations in Namib Sand Sea far from core species range
- Readily found inside the property at suitable habitat intruding into the Sand Sea
- Incidental presence within the property from range overspill
- Present whenever conditions are suitable
- Rarely occur only when conditions are suitable
- Unusual and isolated records
- Feral populations of extralimital species
- Introduced alien species that is managed, occasionally vagrant

Family	Genus	Species	Common Name	NSS Biogeography	NSS Ecological range	NSS Distribution Status	Habitat within property
Kingdom: Animalia		Phylum: Chordata	Class: Reptilia	Order: Testudines			
Dermochelyidae	<i>Dermochelys</i>	<i>coriacea</i>	Leatherback Turtle	d. Bounding	iii. Habitat specialist	11. Vagrant	Marine littoral
Cheloniidae	<i>Chelonia</i>	<i>mydas</i>	Green Turtle	d. Bounding	iii. Habitat specialist	11. Vagrant	Marine littoral
Pelomedusidae	<i>Pelomedusa</i>	<i>subrufa</i>	Helmeted terrapin	d. Bounding	iv. Generalist	11. Vagrant	Water filled pans after floods
Testudinidae	<i>Geochelone</i>	<i>pardalis</i>	Leopard tortoise	d. Bounding	iv. Generalist	07. Interdigitated resident	Absent from dunes and fog zone
Testudinidae	<i>Psammobates</i>	<i>tentorius</i>	Tent tortoise	d. Bounding	iv. Generalist	08. Marginal presence	Succulents on southeastern outcrops
Kingdom: Animalia		Phylum: Chordata	Class: Reptilia	Order: Squamata			
Chamaeleonidae	<i>Chamaeleo</i>	<i>namaquensis</i>	Namaqua Chameleon	c. Widespread	ii. Arid area specialist	04. Common Resident	Throughout property
Amphisbaenidae	<i>Zygaspis</i>	<i>quadrifrons</i>	Kalahari Worm Lizard	d. Bounding	ii. Arid area specialist	07. Interdigitated resident	Sandy plains
Typhlopidae	<i>Rhinotyphlops</i>	<i>schinzi</i>	Schinz's Beaked Blind Snake	d. Bounding	ii. Arid area specialist	07. Interdigitated resident	Sandy plains
Leptotyphlopidae	<i>Leptotyphlops</i>	<i>occidentalis</i>	Western Thread Snake	d. Bounding	i. Dune Sea specialist	03. Near Endemic	Absent from fog zone
Leptotyphlopidae	<i>Leptotyphlops</i>	<i>scutifrons</i>	Peter's Thread Snake	d. Bounding	ii. Arid area specialist	07. Interdigitated resident	Sandy plains
Boidae	<i>Python</i>	<i>anchietae</i>	Anchieta's Dwarf Python	d. Bounding	ii. Arid area specialist	08. Marginal presence	Northeastern outcrop areas
Viperidae	<i>Bitis</i>	<i>arietans</i>	Puffadder	d. Bounding	iv. Generalist	07. Interdigitated resident	Near bushy vegetation
Viperidae	<i>Bitis</i>	<i>caudalis</i>	Horned Adder	d. Bounding	ii. Arid area specialist	04. Common Resident	Absent from dunes and fog zone
Viperidae	<i>Bitis</i>	<i>cornuta</i>	Multihorned Adder	d. Bounding	ii. Arid area specialist	08. Marginal presence	Southeastern rock outcrops
Viperidae	<i>Bitis</i>	<i>peringueyi</i>	Sidewinder Adder	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic	Unconsolidated dunes
Colubridae	<i>Dasypeltis</i>	<i>scabra</i>	Rhombic Egg Eater	d. Bounding	iv. Generalist	05. Rare Resident	Absent from dunes and fog zone
Colubridae	<i>Dipsina</i>	<i>multimaculata</i>	Dwarf Beaked Snake	c. Widespread	ii. Arid area specialist	04. Common Resident	Absent from dunes and fog zone
Colubridae	<i>Lamprophis</i>	<i>fuliginosis</i>	Brown House Snake	d. Bounding	iv. Generalist	05. Rare Resident	Absent from dunes
Colubridae	<i>Philothamnus</i>	<i>semivariiegatus</i>	Spotted Bush Snake	d. Bounding	iii. Habitat specialist	10. Intermittent visitor	Lush Ephemeral River vegetation
Colubridae	<i>Prosymna</i>	<i>frontalis</i>	Southwestern Shovel-snout	d. Bounding	ii. Arid area specialist	03. Near Endemic	Outcrops, inselbergs & gravel plains

Family	Genus	Species	Common Name	NSS Biogeography	NSS Ecological range	NSS Distribution Status	Habitat within property
Colubridae	<i>Psammophis</i>	<i>leightoni namibensis</i>	Namib Sand Snake	c. Widespread	ii. Arid area specialist	03. Near Endemic	Absent from dunes and fog zone
Colubridae	<i>Psammophis</i>	<i>notostictus</i>	Karoo Sand Snake	d. Bounding	ii. Arid area specialist	04. Common Resident	Sandy plains
Colubridae	<i>Psammophis</i>	<i>trigrammus</i>	Western Sand Snake	d. Bounding	ii. Arid area specialist	07. Interdigitated resident	Sandy plains
Colubridae	<i>Pseudaspis</i>	<i>cana</i>	Mole Snake	d. Bounding	iv. Generalist	05. Rare Resident	Absent from dunes
Colubridae	<i>Pythonodipsas</i>	<i>carinata</i>	Western keeled snake	d. Bounding	ii. Arid area specialist	03. Near Endemic	Outcrops, inselbergs & gravel plains
Colubridae	<i>Telescopus</i>	<i>beetzi</i>	Beetz's Tiger Snake	d. Bounding	iv. Generalist	08. Marginal presence	Outcrop areas
Colubridae	<i>Telescopus</i>	<i>semiannulatus</i>	Eastern Tiger Snake	d. Bounding	iv. Generalist	08. Marginal presence	Mainly along ephemeral rivers
Elapidae	<i>Aspidelaps</i>	<i>lubricus infuscatus</i>	Coral snake	d. Bounding	ii. Arid area specialist	03. Near Endemic	Absent from dunes and fog zone
Elapidae	<i>Dendroaspis</i>	<i>polylepis</i>	Black Mamba	d. Bounding	iv. Generalist	08. Marginal presence	Outcrop areas and rivers
Elapidae	<i>Naja</i>	<i>nigricollis woodi</i>	Black Spitting Cobra	d. Bounding	ii. Arid area specialist	07. Interdigitated resident	Outcrop areas and inselbergs
Elapidae	<i>Naja</i>	<i>nivea</i>	Cape Cobra	d. Bounding	ii. Arid area specialist	05. Rare Resident	Outcrop areas, inselbergs and trees
Atractaspidae	<i>Atractaspis</i>	<i>bibronii</i>	Southern burrowing asp	d. Bounding	iv. Generalist	07. Interdigitated resident	Sandy plains
Gerrhosauridae	<i>Cordylosaurus</i>	<i>subtessellatus</i>	Dwarf Plated Lizard	b. Inselbergs	iii. Habitat specialist	06. Relict	Outcrop areas and inselbergs
Cordylidae	<i>Cordylus</i>	<i>campbelli</i>	Campbell's Girdled Lizard	d. Bounding	iii. Habitat specialist	03. Near Endemic	Southeastern rock outcrops
Agamidae	<i>Agama</i>	<i>aculeata</i>	Ground Agama	d. Bounding	ii. Arid area specialist	04. Common Resident	Plains
Agamidae	<i>Agama</i>	<i>anchietae</i>	Anchieta's Agama	d. Bounding	ii. Arid area specialist	08. Marginal presence	Outcrop areas
Lacertidae	<i>Heliobolus</i>	<i>lugubris</i>	Bushveld Lizard	d. Bounding	ii. Arid area specialist	07. Interdigitated resident	Plains
Lacertidae	<i>Meroles</i>	<i>anchietae</i>	Shovel-snouted Lizard	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic	Unconsolidated dunes
Lacertidae	<i>Meroles</i>	<i>cuneirostris</i>	Wedge-snouted Desert lizard	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic	Fog Dune Sea and dune bases
Lacertidae	<i>Meroles</i>	<i>micropholidotus</i>	Small-scaled Desert Lizard	a. Sand Sea	iii. Habitat specialist	01. Strict Endemic	Fogbound Dune Sea only
Lacertidae	<i>Meroles</i>	<i>reticulatus</i>	Reticulated Desert Lizard	d. Bounding	i. Dune Sea specialist	03. Near Endemic	Northwestern Coastal hummocks
Lacertidae	<i>Meroles</i>	<i>suborbitalis</i>	Spotted Desert Lizard	c. Widespread	ii. Arid area specialist	04. Common Resident	Absent from dunes and fog zone

Family	Genus	Species	Common Name	NSS Biogeography	NSS Ecological range	NSS Distribution Status	Habitat within property
Lacertidae	<i>Nucras</i>	<i>tessellata</i>	Western Sandveld Lizard	d. Bounding	ii. Arid area specialist	08. Marginal presence	Southeastern rock outcrops
Lacertidae	<i>Pedioplanis</i>	<i>inornata</i>	Plain Sand Lizard	d. Bounding	ii. Arid area specialist	07. Interdigitated resident	Outcrop areas and inselbergs
Lacertidae	<i>Pedioplanis</i>	<i>lineocellata</i>	Spotted Sand Lizard	d. Bounding	ii. Arid area specialist	07. Interdigitated resident	Gravel plains and outcrop areas
Lacertidae	<i>Pedioplanis</i>	<i>namaquensis</i>	Namaqua Sand Lizard	c. Widespread	ii. Arid area specialist	04. Common Resident	Absent from dunes
Scincidae	<i>Mabuya</i>	<i>acutilabris</i>	Wedge-snouted Skink	d. Bounding	ii. Arid area specialist	07. Interdigitated resident	Sandy plains
Scincidae	<i>Mabuya</i>	<i>capensis</i>	Cape Skink	d. Bounding	iv. Generalist	07. Interdigitated resident	Plains and along river beds
Scincidae	<i>Mabuya</i>	<i>occidentalis</i>	Western Three-striped Skink	d. Bounding	ii. Arid area specialist	04. Common Resident	Absent from dunes and fog zone
Scincidae	<i>Mabuya</i>	<i>spilogaster</i>	Kalahari Tree Skink	d. Bounding	iii. Habitat specialist	07. Interdigitated resident	Common on <i>A. erioloba</i> trees
Scincidae	<i>Mabuya</i>	<i>striata</i>	Striped Skink	d. Bounding	iv. Generalist	04. Common Resident	Plains and historical ruins
Scincidae	<i>Mabuya</i>	<i>sulcata</i>	Western Rock Skink	d. Bounding	ii. Arid area specialist	05. Rare Resident	Outcrop areas
Scincidae	<i>Mabuya</i>	<i>variegata</i>	Variegated Skink	c. Widespread	iv. Generalist	04. Common Resident	Absent from dunes
Scincidae	<i>Scelotes</i>	<i>capensis</i>	Western Dwarf Burrowing Skink	d. Bounding	ii. Arid area specialist	03. Near Endemic	Plains
Scincidae	<i>Typhlacontias</i>	<i>brevipes</i>	Fitzsimons' Burrowing Skink	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic	Fogbound Dunes
Scincidae	<i>Typhlosaurus</i>	<i>braini</i>	Brain's Blind Legless Skink	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic	Fog Dune Sea and dune bases
Gekkonidae	<i>Chondrodactylus</i>	<i>angulifer angulifer</i>	Giant Ground Gecko	d. Bounding	ii. Arid area specialist	04. Common Resident	Plains
Gekkonidae	<i>Chondrodactylus</i>	<i>angulifer namibensis</i>	Namib Ground Gecko	d. Bounding	ii. Arid area specialist	04. Common Resident	Plains
Gekkonidae	<i>Lygodactylus</i>	<i>bradfieldi</i>	Bradfield's Dwarf Gecko	d. Bounding	ii. Arid area specialist	07. Interdigitated resident	Plains
Gekkonidae	<i>Narudasia</i>	<i>festiva</i>	Festive Gecko	d. Bounding	ii. Arid area specialist	08. Marginal presence	Outcrop areas
Gekkonidae	<i>Pachydactylus</i>	<i>bicolor</i>	Velvety Thick-toed Gecko	d. Bounding	ii. Arid area specialist	08. Marginal presence	Northeastern outcrop areas
Gekkonidae	<i>Pachydactylus</i>	<i>punctatus</i>	Speckled Thick-toed Gecko	d. Bounding	ii. Arid area specialist	07. Interdigitated resident	Absent from dunes and fog zone
Gekkonidae	<i>Pachydactylus</i>	<i>rugosus</i>	Rough Thick-toed Gecko	d. Bounding	iv. Generalist	04. Common Resident	Areas with vegetation and rock
Gekkonidae	<i>Pachydactylus</i>	<i>serval</i>	Western Spotted Thick-toed Gecko	d. Bounding	ii. Arid area specialist	07. Interdigitated resident	Outcrop areas and inselbergs

Family	Genus	Species	Common Name	NSS Biogeography	NSS Ecological range	NSS Distribution Status	Habitat within property
Gekkonidae	<i>Pachydactylus</i>	<i>turneri</i>	Turner's Thick-toed Gecko	d. Bounding	iii. Habitat specialist	05. Rare Resident	Outcrop areas, inselbergs and trees
Gekkonidae	<i>Pachydactylus</i>	<i>weberi</i>	Weber's Thick-toed Gecko	d. Bounding	iv. Generalist	04. Common Resident	Outcrop areas
Gekkonidae	<i>Palmatogecko</i>	<i>rangei</i>	Web-footed gecko	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic	Unconsolidated dunes
Gekkonidae	<i>Ptenopus</i>	<i>carpi</i>	Carp's Barking Gecko	d. Bounding	ii. Arid area specialist	08. Marginal presence	Along northern interdune valleys
Gekkonidae	<i>Ptenopus</i>	<i>garrulus</i>	Common Barking gecko	c. Widespread	ii. Arid area specialist	04. Common Resident	Sandy plains
Gekkonidae	<i>Ptenopus</i>	<i>kochi</i>	Koch's Barking Gecko	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic	Interdune valleys and river margins
Varanidae	<i>Varanus</i>	<i>albigularis</i>	Rock Monitor	d. Bounding	iv. Generalist	05. Rare Resident	Outcrop areas and trees
Kingdom: Animalia		Phylum: Chordata	Class: Amphibia	Order: Anura			
Bufonidae	<i>Bufo</i>	<i>hoeschi</i>	Toad	d. Bounding	iii. Habitat specialist	03. Near Endemic	Rocky areas
Bufonidae	<i>Bufo</i>	<i>poweri</i>	Toad	d. Bounding	iv. Generalist	10. Intermittent visitor	Ephemeral rivers after floods
Microhylidae	<i>Phrynomantis</i>	<i>annectens</i>	Marbled Rubber Frog	d. Bounding	iii. Habitat specialist	03. Near Endemic	Rocky areas
Pipidae	<i>Xenopus</i>	<i>laevis</i>	Clawed frog	d. Bounding	iv. Generalist	05. Rare Resident	Pools and springs
Ranidae	<i>Tomopterna</i>	<i>cryptotis</i>	Tremolo Sand Frog	d. Bounding	iv. Generalist	10. Intermittent visitor	Temporary pools
Family	Genus	Species	Common Name	NSS Biogeography	NSS Ecological range	NSS Distribution Status	Habitat within property
Kingdom: Animalia		Phylum: Chordata	Class: Actinopterygii	Order: Cypriniformes			
Cyprinidae	<i>Cyprinus</i>	<i>carpio</i>	Common Carp	d. Bounding	iv. Generalist	12. Alien	Ephemeral rivers after floods
Kingdom: Animalia		Phylum: Chordata	Class: Actinopterygii	Order: Siluriformes			
Clariidae	<i>Clarias</i>	<i>gariepinus</i>	Sharptooth Catfish	d. Bounding	iv. Generalist	11. Vagrant	Ephemeral rivers after floods

Annex 15

Table of Mammals



Namib Sand Sea Biogeography Biogeography description

- a. Sand Sea Sand Sea inhabitants rarely ranging outside dune habitats
- b. Inselbergs Petrophilous inselberg inhabitants occurring as isolated populations within the Sand Sea
- c. Widespread May inhabit any part of the property due to vagility and catholic ecological choice
- d. Boundinging Mostly found adjacent to the Sand Sea and contributing to biodiversity and ecology through suitable habitat inside the property, marginally intruding or absent from dunes
- e. Sandwich Ramsar Specific Sandwich Harbour Ramsar site inhabitants

Ecological range

- i. Dune Sea specialist
- ii. Arid area specialist
- iii. Habitat specialist
- iv. Generalist

Ecological range description

- Psammophilous species restricted to Namib Biome sand dunes
- Euryaceous species restricted to arid biome habitats
- Stenotypic species, habitat, host or prey specific
- Not habitat specific with wide ecological choice

Status

- 01. Strict Endemic
- 02. Dune Endemic
- 03. Near Endemic
- 04. Common Resident
- 05. Rare Resident
- 06. Relict
- 07. Interdigitated resident
- 08. Marginal presence
- 09. Common migrant
- 10. Intermittent visitor
- 11. Vagrant
- 12. Alien
- 13. Domesticated

Status Description

- Psammophilous species only found in Namib Sand Sea
- Psammophilous species in Namib Sand Sea, range extend to outhur Namib Biome dune areas
- Restricted to Namib Biomes
- Common throughout Namib Sand Sea property
- Rarely recorded from Namib Sand Sea property, not unexpected
- Isolated healthy populations in Namib Sand Sea far from core species range
- Readily found inside the property at suitable habitat intruding into the Sand Sea
- Incidental presence within the property from range overspill
- Present whenever conditions are suitable
- Rarely occur only when conditions are suitable
- Unusual and isolated records
- Feral populations of extralimital species
- Introduced alien species that is managed, occasionally vagrant

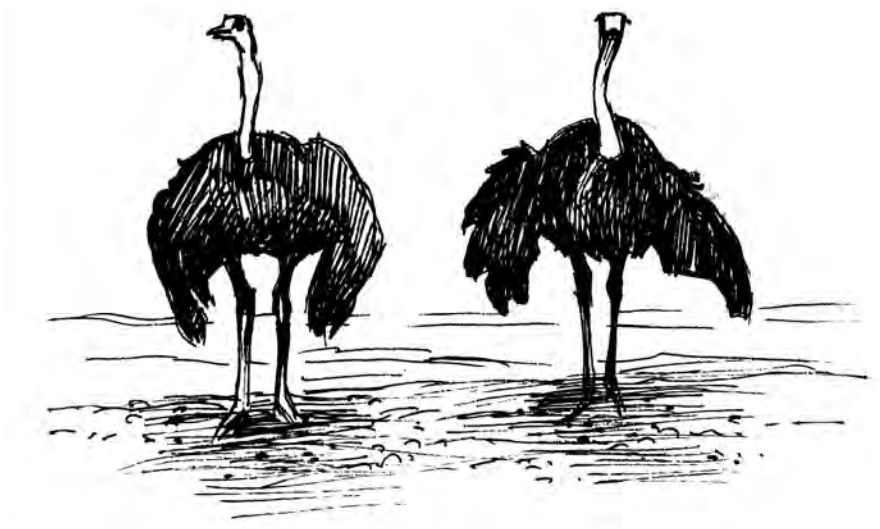
Order	Family	Genus	Species	Common Name	NSS Biogeography	NSS Ecological range	NSS Status
Kingdom: Animalia		Phylum: Chordata		Class: Mammalia			
Afrosoricida	Chrysochloridae	<i>Eremitalpa</i>	<i>granti namibensis</i>	Grant's Golden Mole	a. Sand Sea	i. Dune Sea specialist	02. Dune Endemic
Macroscelidea	Macroscelididae	<i>Macroscelides</i>	<i>proboscideus</i>	Round-eared Elephant-shrew	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Macroscelidea	Macroscelididae	<i>Elephantulus</i>	<i>rupestris</i>	Western rock Elephant-shrew	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Macroscelidea	Macroscelididae	<i>Elephantulus</i>	<i>intufi</i>	Bushveld Elephant-shrew	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Tubulidentata	Orycteropodidae	<i>Orycteropus</i>	<i>afer</i>	Aardvark	d. Bounding	iv. Generalist	07. Interdigitated resident
Paenungulata	Procaviidae	<i>Procavia</i>	<i>capensis</i>	Rock Hyrax	d. Bounding	iii. Habitat specialist	08. Marginal presence
Lagomorpha	Leporidae	<i>Lepus</i>	<i>capensis</i>	Cape Hare	c. Widespread	ii. Arid area specialist	04. Common Resident
Lagomorpha	Leporidae	<i>Lepus</i>	<i>saxatilis</i>	Scrub Hare	d. Bounding	iv. Generalist	07. Interdigitated resident
Lagomorpha	Leporidae	<i>Pronolagus</i>	<i>randensis</i>	Jameson's Rock Rabbit	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Rodentia	Hystriidae	<i>Hystrix</i>	<i>africae australis</i>	Cape Porcupine	d. Bounding	iv. Generalist	07. Interdigitated resident
Rodentia	Petromuridae	<i>Petromus</i>	<i>typicus</i>	Dassie Rat	d. Bounding	iii. Habitat specialist	03. Near Endemic
Rodentia	Pedetidae	<i>Pedetes</i>	<i>capensis</i>	Springhare	d. Bounding	iv. Generalist	07. Interdigitated resident
Rodentia	Sciuridae	<i>Xerus</i>	<i>inaurus</i>	South African Ground Squirrel	d. Bounding	iv. Generalist	07. Interdigitated resident
Rodentia	Sciuridae	<i>Xerus</i>	<i>princeps</i>	Damaras Ground Squirrel	d. Bounding	iv. Generalist	07. Interdigitated resident
Rodentia	Muridae	<i>Rhabdomys</i>	<i>pumilio</i>	Four-striped Grass Mouse	c. Widespread	iv. Generalist	04. Common Resident
Rodentia	Muridae	<i>Thallomys</i>	<i>nigricauda</i>	Black-tailed Tree Rat	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Rodentia	Muridae	<i>Aethomys</i>	<i>chrysophilus</i>	Red Veld Rat	d. Bounding	iv. Generalist	07. Interdigitated resident
Rodentia	Muridae	<i>Micaelamys</i>	<i>namapuensis</i>	Namaqua Rock Mouse	d. Bounding	iv. Generalist	07. Interdigitated resident
Rodentia	Muridae	<i>Parotomys</i>	<i>littledalei</i>	Littledale's Whistling Rat	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Rodentia	Muridae	<i>Desmodillus</i>	<i>auricularis</i>	Cape Short-tailed Gerbil	d. Bounding	iv. Generalist	07. Interdigitated resident
Rodentia	Muridae	<i>Gerbillurus</i>	<i>paeba</i>	Hairy-footed Gerbil	d. Bounding	iv. Generalist	07. Interdigitated resident
Rodentia	Muridae	<i>Gerbillurus</i>	<i>tytonis</i>	Dune Hairy-footed Gerbil	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic
Rodentia	Muridae	<i>Gerbillurus</i>	<i>vallinus</i>	Brush-tailed Hairy-footed Gerbil	d. Bounding	ii. Arid area specialist	07. Interdigitated resident
Rodentia	Muridae	<i>Gerbillurus</i>	<i>setzeri</i>	Setzer's Hairy-footed Gerbil	d. Bounding	ii. Arid area specialist	03. Near Endemic
Rodentia	Muridae	<i>Malacothrix</i>	<i>typica</i>	Gerbil Mouse	d. Bounding	iv. Generalist	07. Interdigitated resident
Rodentia	Muridae	<i>Petromyscus</i>	<i>collinus</i>	Pygmy Rock Mouse	d. Bounding	iv. Generalist	07. Interdigitated resident
Rodentia	Muridae	<i>Mus</i>	<i>musculus</i>	House Mouse	d. Bounding	iv. Generalist	12. Alien
Rodentia	Muridae	<i>Rattus</i>	<i>rattus</i>	Common House Rat	d. Bounding	iv. Generalist	12. Extinct Alien
Primates	Cercopithecidae	<i>Papio</i>	<i>hamadryas</i>	Chacma Baboon	d. Bounding	iv. Generalist	08. Marginal presence
Eulipotyphla	Soricidae	<i>Crociduna</i>	<i>cyanea</i>	Reddish-grey Musk Shrew	d. Bounding	iv. Generalist	07. Interdigitated resident
Chiroptera	Pteropodidae	<i>Eidolon</i>	<i>helvum</i>	Straw-coloured Fruit Bat	d. Bounding	iii. Habitat specialist	11. Vagrant
Chiroptera	Molossidae	<i>Tadarida</i>	<i>aegyptiaca</i>	Egyptian Free-tailed Bat	c. Widespread	iv. Generalist	07. Interdigitated resident
Chiroptera	Vespertilionidae	<i>Neoromicia</i>	<i>capensis</i>	Cape Serotine Bat	d. Bounding	iv. Generalist	07. Interdigitated resident
Chiroptera	Vespertilionidae	<i>Cistugo</i>	<i>seabrai</i>	Angolan Hairy Bat	d. Bounding	iv. Generalist	07. Interdigitated resident
Chiroptera	Vespertilionidae	<i>Laephotis</i>	<i>namibensis</i>	Namib Long-eared Bat	d. Bounding	iii. Habitat specialist	03. Near Endemic
Chiroptera	Vespertilionidae	<i>Eptesicus</i>	<i>hottentotus</i>	Long-tailed Serotine Bat	d. Bounding	iv. Generalist	07. Interdigitated resident

Order	Family	Genus	Species	Common Name	NSS Biogeography	NSS Ecological range	NSS Status
Chiroptera	Nycteridae	<i>Nycteris</i>	<i>thebaica</i>	Egyptian Slit-faced Bat	c. Widespread	iv. Generalist	07. Interdigitated resident
Chiroptera	Rhinolophidae	<i>Rhinolophus</i>	<i>clivosus</i>	Geoffroy's Horseshoe Bat	d. Bounding	iv. Generalist	07. Interdigitated resident
Pholidota	Manidae	<i>Manis</i>	<i>temminckii</i>	Cape Pangolin	d. Bounding	iii. Habitat specialist	10. Intermittent visitor
Carnivora	Hyaenidae	<i>Proteles</i>	<i>cristatus</i>	Aardwolf	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Carnivora	Hyaenidae	<i>Parahyaena</i>	<i>brunnea</i>	Brown Hyaena	c. Widespread	iv. Generalist	04. Common Resident
Carnivora	Hyaenidae	<i>Crocuta</i>	<i>crocuta</i>	Spotted Hyaena	d. Bounding	iv. Generalist	07. Interdigitated resident
Carnivora	Felidae	<i>Acinonyx</i>	<i>jubatus</i>	Cheetah	d. Bounding	iv. Generalist	07. Interdigitated resident
Carnivora	Felidae	<i>Panthera</i>	<i>pardus</i>	Leopard	d. Bounding	iv. Generalist	07. Interdigitated resident
Carnivora	Felidae	<i>Caracal</i>	<i>caracal</i>	Caracal	d. Bounding	iv. Generalist	07. Interdigitated resident
Carnivora	Felidae	<i>Felis</i>	<i>silvestris</i>	African Wild Cat	c. Widespread	iv. Generalist	05. Rare Resident
Carnivora	Felidae	<i>Felis</i>	<i>catus</i>	Domestic Cat	d. Bounding	iv. Generalist	13. Domesticated
Carnivora	Felidae	<i>Panthera</i>	<i>leo</i>	Lion	d. Bounding	iv. Generalist	10. Intermittent visitor
Carnivora	Viverridae	<i>Genetta</i>	<i>genetta</i>	Small-spotted Genet	d. Bounding	iv. Generalist	07. Interdigitated resident
Carnivora	Herpestidae	<i>Suricata</i>	<i>suricatta</i>	Suricate / Meerkat	d. Bounding	iv. Generalist	07. Interdigitated resident
Carnivora	Herpestidae	<i>Cynictis</i>	<i>penicillata</i>	Yellow Mongoose	d. Bounding	iv. Generalist	07. Interdigitated resident
Carnivora	Canidae	<i>Otocyon</i>	<i>megalotis</i>	Bat-eared Fox	d. Bounding	iv. Generalist	07. Interdigitated resident
Carnivora	Canidae	<i>Vulpes</i>	<i>chama</i>	Cape Fox	c. Widespread	iv. Generalist	04. Common Resident
Carnivora	Canidae	<i>Canis</i>	<i>mesomelas</i>	Black-backed Jackal	c. Widespread	iv. Generalist	04. Common Resident
Carnivora	Canidae	<i>Canis</i>	<i>lupus</i>	Domestic Dog	d. Bounding	iv. Generalist	13. Domesticated
Carnivora	Canidae	<i>Lycaon</i>	<i>pictus</i>	Cape Hunting Dog	d. Bounding	iv. Generalist	14. Extinct intermittent visitor
Carnivora	Mustelidae	<i>Mellivora</i>	<i>capensis</i>	Honey Badger	d. Bounding	iv. Generalist	07. Interdigitated resident
Carnivora	Mustelidae	<i>Ictonyx</i>	<i>striatus</i>	Striped Polecat	d. Bounding	iv. Generalist	07. Interdigitated resident
Carnivora	Otariidae	<i>Arctocephalus</i>	<i>pusillus</i>	South African Fur Seal	d. Bounding	iii. Habitat specialist	08. Marginal presence
Carnivora	Phocidae	<i>Mirounga</i>	<i>leonina</i>	Southern Elephant Seal	d. Bounding	iii. Habitat specialist	11. Vagrant
Perissodactyla	Rhinocerotidae	<i>Diceros</i>	<i>bicornis</i>	Black Rhinoceros	d. Bounding	iv. Generalist	14. Extinct marginal resident
Perissodactyla	Equidae	<i>Equus</i>	<i>asinus</i>	Donkey	d. Bounding	iv. Generalist	13. Domesticated
Perissodactyla	Equidae	<i>Equus</i>	<i>caballus</i>	Horse	d. Bounding	iv. Generalist	13. Domesticated
Perissodactyla	Equidae	<i>Equus</i>	<i>zebra hartmannae</i>	Mountain Zebra	d. Bounding	iv. Generalist	03. Near Endemic
Suiformes	Suidae	<i>Phacochoerus</i>	<i>africanus</i>	Common Warthog	d. Bounding	iv. Generalist	08. Marginal presence
Ruminantia	Giraffidae	<i>Giraffa</i>	<i>camelopardalis</i>	Giraffe	d. Bounding	iv. Generalist	14. Extinct marginal resident
Ruminantia	Bovidae	<i>Tragelaphus</i>	<i>strepsiceros</i>	Greater kudu	d. Bounding	iv. Generalist	08. Marginal presence
Ruminantia	Bovidae	<i>Oryx</i>	<i>gazella</i>	Gemsbok	c. Widespread	iv. Generalist	04. Common Resident
Ruminantia	Bovidae	<i>Sylvicapra</i>	<i>grimmia</i>	Common Duiker	d. Bounding	iv. Generalist	08. Marginal presence
Ruminantia	Bovidae	<i>Antidorcas</i>	<i>marsupialis</i>	Springbok	d. Bounding	iv. Generalist	04. Common Resident
Ruminantia	Bovidae	<i>Raphicerus</i>	<i>campestris</i>	Steenbok	c. Widespread	iv. Generalist	04. Common Resident
Ruminantia	Bovidae	<i>Oreotragus</i>	<i>oreotragus</i>	Klipspringer	d. Bounding	iii. Habitat specialist	07. Interdigitated resident
Ruminantia	Bovidae	<i>Bos</i>	<i>indicus</i>	Domestic Cow	d. Bounding		13. Domesticated

Order	Family	Genus	Species	Common Name	NSS Biogeography	NSS Ecological range	NSS Status
Ruminantia	Bovidae	<i>Capra</i>	<i>aegagrus hircus</i>	Domestic Goat	d. Bounding		13. Domesticated
Ruminantia	Bovidae	<i>Ovis</i>	<i>aries</i>	Domestic Sheep	d. Bounding		13. Domesticated

Annex 16

Table of Birds



Namib Sand Sea Biogeography Biogeography description

- a. Sand Sea Sand Sea inhabitants rarely ranging outside dune habitats
- b. Inselbergs Petrophilous inselberg inhabitants occurring as isolated populations within the Sand Sea
- c. Widespread May inhabit any part of the property due to vagility and catholic ecological choice
- d. Boundinging Mostly found adjacent to the Sand Sea and contributing to biodiversity and ecology through suitable habitat inside the property, marginally intruding or absent from dunes
- e. Sandwich Ramsar Specific Sandwich Harbour Ramsar site inhabitants

Ecological range

- i. Dune Sea specialist
- ii. Arid area specialist
- iii. Habitat specialist
- iv. Generalist

Ecological range description

- Psammophilous species restricted to Namib Biome sand dunes
- Euryaceous species restricted to arid biome habitats
- Stenotypic species, habitat, host or prey specific
- Not habitat specific with wide ecological choice

Status

- 01. Strict Endemic
- 02. Dune Endemic
- 03. Near Endemic
- 04. Common Resident
- 05. Rare Resident
- 06. Relict
- 07. Interdigitated resident
- 08. Marginal presence
- 09. Common migrant
- 10. Intermittent visitor
- 11. Vagrant
- 12. Alien
- 13. Domesticated

Status Description

- Psammophilous species only found in Namib Sand Sea
- Psammophilous species in Namib Sand Sea, range extend to outhur Namib Biome dune areas
- Restricted to Namib Biomes
- Common throughout Namib Sand Sea property
- Rarely recorded from Namib Sand Sea property, not unexpected
- Isolated healthy populations in Namib Sand Sea far from core species range
- Readily found inside the property at suitable habitat intruding into the Sand Sea
- Incidental presence within the property from range overspill
- Present whenever conditions are suitable
- Rarely occur only when conditions are suitable
- Unusual and isolated records
- Feral populations of extralimital species
- Introduced alien species that is managed, occasionally vagrant

Order	Family	Genus	Species	Common Name	NSS Biogeography	NSS Ecological range	NSS Status	Habitat within Property
Kingdom: Animalia		Phylum: Chordata		Class: Aves				
Struthioniformes	Struthionidae	<i>Struthio</i>	<i>camelus</i>	Ostrich	c. Widespread	iv. Generalist	04. Common Resident	Throughout area
Sphenisciformes	Spheniscidae	<i>Spheniscus</i>	<i>demersus</i>	African Penguin	d. Bounding	iii. Habitat specialist	07. Interdigitated resident	Coast, breeds at Sylvia Hill and offshore islands
Podicipediformes	Podicipedidae	<i>Podiceps</i>	<i>cristatus</i>	Great Crested Grebe	e. Sandwich	iii. Habitat specialist	07. Interdigitated resident	Sandwich Ramsar site
Podicipediformes	Podicipedidae	<i>Tachybaptus</i>	<i>ruficollis</i>	Dabchick	e. Sandwich	iii. Habitat specialist	07. Interdigitated resident	Sandwich Ramsar site, visitor at pans with water
Podicipediformes	Podicipedidae	<i>Podiceps</i>	<i>nigricollis</i>	Blacknecked grebe	e. Sandwich	iii. Habitat specialist	07. Interdigitated resident	Sandwich Ramsar site
Pelecaniformes	Pelecanidae	<i>Pelicanus</i>	<i>onocrotalus</i>	White Pelican	e. Sandwich	iii. Habitat specialist	07. Interdigitated resident	Sandwich Ramsar site
Pelecaniformes	Pelecanidae	<i>Pelecanus</i>	<i>rufescens</i>	Pinkbacked Pelican	e. Sandwich	iii. Habitat specialist	11. Vagrant	Sandwich Ramsar site
Pelecaniformes	Sulidae	<i>Morus</i>	<i>capensis</i>	Cape Gannet	d. Bounding	iii. Habitat specialist	08. Marginal presence	Coast, breeds on offshore islands
Pelecaniformes	Phalacrocoracidae	<i>Phalacrocorax</i>	<i>carbo</i>	Whitebreasted Cormorant	d. Bounding	iii. Habitat specialist	08. Marginal presence	Coast, breeds on offshore islands
Pelecaniformes	Phalacrocoracidae	<i>Phalacrocorax</i>	<i>capensis</i>	Cape Cormorant	d. Bounding	iii. Habitat specialist	08. Marginal presence	Coast, breeds on offshore islands
Pelecaniformes	Phalacrocoracidae	<i>Phalacrocorax</i>	<i>neglectus</i>	Bank Cormorant	d. Bounding	iii. Habitat specialist	08. Marginal presence	Coast, breeds on offshore islands
Pelecaniformes	Phalacrocoracidae	<i>Phalacrocorax</i>	<i>africanus</i>	Reed Cormorant	e. Sandwich	iii. Habitat specialist	10. Intermittent visitor	Sandwich Ramsar site, migrant
Pelecaniformes	Phalacrocoracidae	<i>Phalacrocorax</i>	<i>coronatus</i>	Crowned Cormorant	d. Bounding	iii. Habitat specialist	07. Interdigitated resident	Coast, breeds on offshore islands
Pelecaniformes	Anhingidae	<i>Anhinga</i>	<i>melanogaster</i>	Darter	e. Sandwich	iii. Habitat specialist	10. Intermittent visitor	Sandwich Ramsar site, migrant
Ciconiiformes	Ardeidae	<i>Ardea</i>	<i>cinerea</i>	Grey Heron	e. Sandwich	iii. Habitat specialist	08. Marginal presence	Sandwich Ramsar site
Ciconiiformes	Ardeidae	<i>Ardea</i>	<i>melanocephala</i>	Blackheaded Heron	d. Bounding	iii. Habitat specialist	09. Common migrant	Sandwich Ramsar site and pans after good rain
Ciconiiformes	Ardeidae	<i>Ardea</i>	<i>purpurea</i>	Purple Heron	e. Sandwich	iii. Habitat specialist	10. Intermittent visitor	Sandwich Ramsar site, migrant

Order	Family	Genus	Species	Common Name	NSS Biogeography	NSS Ecological range	NSS Status	Habitat within Property
Ciconiiformes	Ardeidae	<i>Casmerodius</i>	<i>albus</i>	Great White Heron	e. Sandwich	iii. Habitat specialist	10. Intermittent visitor	Sandwich Ramsar site, migrant
Ciconiiformes	Ardeidae	<i>Egretta</i>	<i>garzetta</i>	Little Egret	e. Sandwich	iii. Habitat specialist	07. Interdigitated resident	Sandwich Ramsar site
Ciconiiformes	Ardeidae	<i>Egretta</i>	<i>intermedia</i>	Yellowbilled Egret	d. Boundinging	iii. Habitat specialist	10. Intermittent visitor	Sandwich Ramsar site, migrant
Ciconiiformes	Ardeidae	<i>Bubulcus</i>	<i>ibis</i>	Cattle Egret	d. Boundinging	iii. Habitat specialist	10. Intermittent visitor	Eastern boundary, migrant
Ciconiiformes	Ardeidae	<i>Ardeola</i>	<i>ralloides</i>	Squacco Heron	d. Boundinging	iii. Habitat specialist	11. Vagrant	Sandwich Ramsar site
Ciconiiformes	Ardeidae	<i>Nycticorax</i>	<i>nycticorax</i>	Blackcrowned Night Heron	e. Sandwich	iii. Habitat specialist	07. Interdigitated resident	Sandwich Ramsar site
Ciconiiformes	Ardeidae	<i>Ixobrychys</i>	<i>sturmii</i>	Dwarf Bittern	d. Boundinging	iii. Habitat specialist	11. Vagrant	Sandwich Ramsar site
Ciconiiformes	Ardeidae	<i>Ixobrychys</i>	<i>minutus</i>	Little Bittern	d. Boundinging	iii. Habitat specialist	11. Vagrant	Sandwich Ramsar site
Ciconiiformes	Scopidae	<i>Scopus</i>	<i>umbretta</i>	Hamerkop	d. Boundinging	iii. Habitat specialist	11. Vagrant	Eastern boundary, ephemeral rivers
Ciconiiformes	Ciconiidae	<i>Ciconia</i>	<i>ciconia</i>	White Stork	d. Boundinging	iv. Generalist	10. Intermittent visitor	Eastern boundary, migrant
Ciconiiformes	Ciconiidae	<i>Ciconia</i>	<i>nigra</i>	Black Stork	d. Boundinging	iv. Generalist	10. Intermittent visitor	Eastern boundary, migrant
Ciconiiformes	Ciconiidae	<i>Ciconia</i>	<i>abdimii</i>	Abdim's Stork	d. Boundinging	iv. Generalist	10. Intermittent visitor	Eastern boundary, migrant
Ciconiiformes	Ciconiidae	<i>Leptoptilos</i>	<i>crumeniferus</i>	Marabou Stork	e. Sandwich	iv. Generalist	11. Vagrant	Sandwich Ramsar site
Ciconiiformes	Plataleidae	<i>Platalea</i>	<i>alba</i>	African Spoonbill	e. Sandwich	iv. Generalist	11. Vagrant	Sandwich Ramsar site
Phoenicopteriformes	Phoenicopteridae	<i>Phoenicopterus</i>	<i>ruber</i>	Greater Flamingo	e. Sandwich	iii. Habitat specialist	07. Interdigitated resident	Sandwich Ramsar site
Phoenicopteriformes	Phoenicopteridae	<i>Phoenicopterus</i>	<i>minor</i>	Lesser Flamingo	e. Sandwich	iii. Habitat specialist	07. Interdigitated resident	Sandwich Ramsar site
Anseriformes	Anatidae	<i>Dendrocynna</i>	<i>viduata</i>	Whitefaced Duck	d. Boundinging	iii. Habitat specialist	11. Vagrant	Sandwich Ramsar site
Anseriformes	Anatidae	<i>Thalassornis</i>	<i>leuconotus</i>	Whitebacked Duck	e. Sandwich	iii. Habitat specialist	07. Interdigitated resident	Sandwich Ramsar site
Anseriformes	Anatidae	<i>Tadorna</i>	<i>cana</i>	South African Shelduck	e. Sandwich	iii. Habitat specialist	07. Interdigitated resident	Sandwich Ramsar site
Anseriformes	Anatidae	<i>Anas</i>	<i>undulata</i>	Yellowbilled Duck	e. Sandwich	iii. Habitat specialist	10. Intermittent visitor	Sandwich Ramsar site, migrant

Order	Family	Genus	Species	Common Name	NSS Biogeography	NSS Ecological range	NSS Status	Habitat within Property
Anseriformes	Anatidae	<i>Anas</i>	<i>hottentota</i>	Hottentot Teal	e. Sandwich	iii. Habitat specialist	10. Intermittent visitor	Sandwich Ramsar site
Anseriformes	Anatidae	<i>Plectropterus</i>	<i>gambensis</i>	Spurwinged Goose	e. Sandwich	iii. Habitat specialist	10. Intermittent visitor	Eastern boundary
Anseriformes	Anatidae	<i>Alopochen</i>	<i>aegytiacus</i>	Egyptian Goose	e. Sandwich	iii. Habitat specialist	10. Intermittent visitor	Sandwich Ramsar site, migrant
Anseriformes	Anatidae	<i>Anas</i>	<i>capensis</i>	Cape Teal	e. Sandwich	iii. Habitat specialist	07. Interdigitated resident	Sandwich Ramsar site
Anseriformes	Anatidae	<i>Anas</i>	<i>erythrorhyncha</i>	Redbilled Teal	e. Sandwich	iii. Habitat specialist	10. Intermittent visitor	Sandwich Ramsar site, migrant
Anseriformes	Anatidae	<i>Anas</i>	<i>smithii</i>	Cape Shoveller	e. Sandwich	iii. Habitat specialist	10. Intermittent visitor	Sandwich Ramsar site, migrant
Anseriformes	Anatidae	<i>Netta</i>	<i>erythrophthalma</i>	Southern Pochard	e. Sandwich	iii. Habitat specialist	07. Interdigitated resident	Sandwich Ramsar site
Anseriformes	Anatidae	<i>Oxyura</i>	<i>maccoa</i>	Maccoa Duck	e. Sandwich	iii. Habitat specialist	09. Common migrant	Sandwich Ramsar site
Falconiformes	Sagittariidae	<i>Sagittarius</i>	<i>serpentarius</i>	Secretarybird	d. Bounding	iv. Generalist	07. Interdigitated resident	Eastern boundary
Falconiformes	Accipitridae	<i>Gyps</i>	<i>coprotheres</i>	Cape Vulture	d. Bounding	iii. Habitat specialist	08. Marginal presence	Central eastern boundary
Falconiformes	Accipitridae	<i>Gyps</i>	<i>africanus</i>	Whitebacked Vulture	d. Bounding	iv. Generalist	08. Marginal presence	Trees at rivers & pans
Falconiformes	Accipitridae	<i>Aegypius</i>	<i>tracheliotus</i>	Lappetfaced Vulture	d. Bounding	iv. Generalist	07. Interdigitated resident	Trees at rivers & pans
Falconiformes	Accipitridae	<i>Milvus</i>	<i>migrans</i>	Yellowbilled/Black Kite	d. Bounding	iv. Generalist	09. Common migrant	Northeastern boundary
Falconiformes	Accipitridae	<i>Elanus</i>	<i>caeruleus</i>	Blackshouldered Kite	d. Bounding	iv. Generalist	05. Rare Resident	Northeastern boundary
Falconiformes	Accipitridae	<i>Aquila</i>	<i>verrauxii</i>	Black Eagle	d. Bounding	iv. Generalist	07. Interdigitated resident	Eastern boundary
Falconiformes	Accipitridae	<i>Aquila</i>	<i>rapax</i>	Tawny Eagle	d. Bounding	iv. Generalist	11. Vagrant	Eastern boundary
Falconiformes	Accipitridae	<i>Aquila</i>	<i>nipalensis</i>	Steppe Eagle	d. Bounding	iv. Generalist	10. Intermittent visitor	Northeastern boundary, migrant
Falconiformes	Accipitridae	<i>Hieraaetus</i>	<i>pennatus</i>	Booted Eagle	d. Bounding	iv. Generalist	08. Marginal presence	Eastern boundary
Falconiformes	Accipitridae	<i>Hieraaetus</i>	<i>spilogaster</i>	African Hawk Eagle	d. Bounding	iv. Generalist	10. Intermittent visitor	Eastern boundary
Falconiformes	Accipitridae	<i>Polemaetus</i>	<i>bellicosus</i>	Martial Eagle	d. Bounding	iv. Generalist	08. Marginal presence	Eastern boundary

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Falconiformes	Accipitridae	<i>Circaetus</i>	<i>pectoralis</i>	Blackbreasted Snake Eagle	d. Bounding	iv. Generalist	07. Interdigitated resident	Eastern boundary
Falconiformes	Accipitridae	<i>Buteo</i>	<i>buteo</i>	Steppe Buzzard	d. Bounding	iv. Generalist	10. Intermittent visitor	Eastern boundary, migrant
Falconiformes	Accipitridae	<i>Buteo</i>	<i>rufofuscus</i>	Jackal Buzzard	d. Bounding	iv. Generalist	08. Marginal presence	Northern boundary and Sandwich Ramsar site
Falconiformes	Accipitridae	<i>Buteo</i>	<i>augur</i>	Augur Buzzard	d. Bounding	iv. Generalist	07. Interdigitated resident	Eastern boundary
Falconiformes	Accipitridae	<i>Micronisus</i>	<i>gabar</i>	Gabar Goshawk	d. Bounding	iv. Generalist	08. Marginal presence	Northeastern boundary
Falconiformes	Accipitridae	<i>Melierax</i>	<i>canorus</i>	Pale Chanting Goshawk	c. Widespread	ii. Arid area specialist	04. Common Resident	Eastern boundary
Falconiformes	Accipitridae	<i>Circus</i>	<i>ranivorus</i>	African Marsh Harrier	e. Sandwich	iii. Habitat specialist	07. Interdigitated resident	Isolated at Sandwich Ramsar site
Falconiformes	Accipitridae	<i>Circus</i>	<i>maurus</i>	Black Harrier	d. Bounding	iv. Generalist	10. Intermittent visitor	Northern & eastern boundary
Falconiformes	Pandionidae	<i>Pandion</i>	<i>haliaetus</i>	Osprey	e. Sandwich	iii. Habitat specialist	10. Intermittent visitor	Sandwich Ramsar site, migrant
Falconiformes	Falconidae	<i>Falco</i>	<i>peregrinus</i>	Peregrine Falcon	d. Bounding	iv. Generalist	08. Marginal presence	Central eastern boundary
Falconiformes	Falconidae	<i>Falco</i>	<i>biarmicus</i>	Lanner Falcon	d. Bounding	iv. Generalist	07. Interdigitated resident	Northern & eastern boundary
Falconiformes	Falconidae	<i>Falco</i>	<i>subbuteo</i>	Hobby Falcon	d. Bounding	iv. Generalist	11. Vagrant	Northern boundary
Falconiformes	Falconidae	<i>Falco</i>	<i>chicquera</i>	Rednecked Falcon	d. Bounding	iv. Generalist	07. Interdigitated resident	Eastern boundary
Falconiformes	Falconidae	<i>Falco</i>	<i>verspertinus</i>	Western Redfooted Kestrel	d. Bounding	iv. Generalist	10. Intermittent visitor	Northern boundary, migrant
Falconiformes	Falconidae	<i>Falco</i>	<i>rupicolus</i>	Rock Kestrel	d. Bounding	iv. Generalist	07. Interdigitated resident	Northern & eastern boundary
Falconiformes	Falconidae	<i>Falco</i>	<i>rupicoloides</i>	Greater Kestrel	d. Bounding	iv. Generalist	07. Interdigitated resident	Northern & eastern boundary
Falconiformes	Falconidae	<i>Falco</i>	<i>naumanni</i>	Lesser Kestrel	d. Bounding	iv. Generalist	08. Marginal presence	Eastern boundary
Falconiformes	Falconidae	<i>Polyhierax</i>	<i>semitorquatus</i>	Pygmy Falcon	d. Bounding	ii. Arid area specialist	05. Rare Resident	Shares sociable weaver nest
Galliformes	Phasianidae	<i>Francolinus</i>	<i>adpersus</i>	Redbilled Francolin	d. Bounding	iv. Generalist	08. Marginal presence	Northeastern boundary

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Galliformes	Phasianidae	<i>Coturnix</i>	<i>coturnix</i>	Common Quail	d. Bounding	iv. Generalist	09. Common migrant	Eastern boundary
Galliformes	Phasianidae	<i>Gallus</i>	<i>gallus</i>	Domestic chicken	d. Bounding	iv. Generalist	13. Domesticated	
Galliformes	Numididae	<i>Numida</i>	<i>meleagris</i>	Helmeted Guinea fowl	d. Bounding	iv. Generalist	07. Interdigitated resident	Northeastern boundary
Gruiformes	Turnicidae	<i>Turnix</i>	<i>sylvatica</i>	Kurrichane Buttonquail	d. Bounding	iv. Generalist	10. Intermittent visitor	Eastern boundary
Gruiformes	Rallidae	<i>Amaurornis</i>	<i>flavirostris</i>	Black Crake	e. Sandwich	iii. Habitat specialist	07. Interdigitated resident	Sandwich Ramsar site
Gruiformes	Rallidae	<i>Porphyrio</i>	<i>porphyrio</i>	Purple Gallinule	e. Sandwich	iii. Habitat specialist	07. Interdigitated resident	Sandwich Ramsar site
Gruiformes	Rallidae	<i>Gallinula</i>	<i>chloropus</i>	Moorhen	e. Sandwich	iii. Habitat specialist	07. Interdigitated resident	Sandwich Ramsar site
Gruiformes	Rallidae	<i>Fulica</i>	<i>cristata</i>	Redknobbed Coot	e. Sandwich	iii. Habitat specialist	07. Interdigitated resident	Sandwich Ramsar site
Gruiformes	Otididae	<i>Ardeotis</i>	<i>kori</i>	Kori Bustard	d. Bounding	iv. Generalist	08. Marginal presence	Eastern boundary
Gruiformes	Otididae	<i>Neotis</i>	<i>ludwiggii</i>	Ludwig's Bustard	d. Bounding	ii. Arid area specialist	07. Interdigitated resident	Dunes, northern & eastern boundary
Gruiformes	Otididae	<i>Eupodotis</i>	<i>vigorsii</i>	Karoo Korhaan	d. Bounding	ii. Arid area specialist	07. Interdigitated resident	Southern and eastern boundary
Gruiformes	Otididae	<i>Eupodotis</i>	<i>rueppellii</i>	Rueppell's Korhaan	d. Bounding	ii. Arid area specialist	03. Near Endemic	Northern and eastern boundary
Gruiformes	Otididae	<i>Eupodotis</i>	<i>afra</i>	Black Korhaan	d. Bounding	ii. Arid area specialist	08. Marginal presence	Eastern boundary
Charadriiformes	Jacaniidae	<i>Actophilornis</i>	<i>africanus</i>	African Jacana	d. Bounding	iii. Habitat specialist	11. Vagrant	Sandwich Ramsar site
Charadriiformes	Haematopodidae	<i>Haematopus</i>	<i>moquini</i>	Black Oystercatcher	d. Bounding	iii. Habitat specialist	07. Interdigitated resident	Coast
Charadriiformes	Charadriidae	<i>Charadrius</i>	<i>hiaticula</i>	Ringed Plover	e. Sandwich	iii. Habitat specialist	09. Common migrant	Sandwich Ramsar site
Charadriiformes	Charadriidae	<i>Charadrius</i>	<i>marginatus</i>	Whitefronted Plover	d. Bounding	iii. Habitat specialist	07. Interdigitated resident	Coast
Charadriiformes	Charadriidae	<i>Charadrius</i>	<i>pallidus</i>	Chestnutbanded Plover	e. Sandwich	iii. Habitat specialist	08. Marginal presence	Sandwich Ramsar site
Charadriiformes	Charadriidae	<i>Charadrius</i>	<i>pecuarius</i>	Kittlitz's Plover	d. Bounding	iii. Habitat specialist	08. Marginal presence	Coast
Charadriiformes	Charadriidae	<i>Charadrius</i>	<i>tricoloris</i>	Threebanded Plover	d. Bounding	iii. Habitat specialist	10. Intermittent visitor	Pans with water
Charadriiformes	Charadriidae	<i>Charadrius</i>	<i>leschenaultii</i>	Sand Plover	e. Sandwich	iii. Habitat specialist	09. Common migrant	Sandwich Ramsar site
Charadriiformes	Charadriidae	<i>Charadrius</i>	<i>asiaticus</i>	Caspian Plover	e. Sandwich	iii. Habitat specialist	09. Common migrant	Sandwich Ramsar site

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Charadriiformes	Charadriidae	<i>Pluvialis</i>	<i>squatarola</i>	Grey Plover	d. Boundinging	iii. Habitat specialist	07. Interdigitated resident	Coast
Charadriiformes	Charadriidae	<i>Vanellus</i>	<i>coronatus</i>	Crowned Plover	d. Boundinging	iii. Habitat specialist	07. Interdigitated resident	Eastern boundary
Charadriiformes	Charadriidae	<i>Vanellus</i>	<i>armatus</i>	Blacksmith Plover	d. Boundinging	iii. Habitat specialist	08. Marginal presence	Eastern boundary
Charadriiformes	Scolopacidae	<i>Arenaria</i>	<i>interpres</i>	Turnstone	d. Boundinging	iii. Habitat specialist	09. Common migrant	Coast
Charadriiformes	Scolopacidae	<i>Xenus</i>	<i>cinereus</i>	Terek Sandpiper	e. Sandwich	iii. Habitat specialist	09. Common migrant	Sandwich Ramsar site
Charadriiformes	Scolopacidae	<i>Tringa</i>	<i>hypoleucos</i>	Common Sandpiper	e. Sandwich	iii. Habitat specialist	09. Common migrant	Sandwich Ramsar site
Charadriiformes	Scolopacidae	<i>Tringa</i>	<i>glareola</i>	Wood Sandpiper	e. Sandwich	iii. Habitat specialist	09. Common migrant	Sandwich Ramsar site
Charadriiformes	Scolopacidae	<i>Tringa</i>	<i>totanus</i>	Redshank	e. Sandwich	iii. Habitat specialist	09. Common migrant	Sandwich Ramsar site
Charadriiformes	Scolopacidae	<i>Tringa</i>	<i>stagnatilis</i>	Marsh Sandpiper	e. Sandwich	iii. Habitat specialist	09. Common migrant	Sandwich Ramsar site
Charadriiformes	Scolopacidae	<i>Tringa</i>	<i>nebularia</i>	Greenshank	e. Sandwich	iii. Habitat specialist	09. Common migrant	Sandwich Ramsar site
Charadriiformes	Scolopacidae	<i>Calidris</i>	<i>canatus</i>	Knot	e. Sandwich	iii. Habitat specialist	09. Common migrant	Sandwich Ramsar site
Charadriiformes	Scolopacidae	<i>Calidris</i>	<i>ferruginea</i>	Curlew Sandpiper	e. Sandwich	iii. Habitat specialist	09. Common migrant	Sandwich Ramsar site
Charadriiformes	Scolopacidae	<i>Calidris</i>	<i>minuta</i>	Little Stint	e. Sandwich	iii. Habitat specialist	09. Common migrant	Sandwich Ramsar site
Charadriiformes	Scolopacidae	<i>Calidris</i>	<i>bairdii</i>	Baird's Sandpiper	e. Sandwich	iii. Habitat specialist	09. Common migrant	Sandwich Ramsar site
Charadriiformes	Scolopacidae	<i>Calidris</i>	<i>melanotos</i>	Pectoral Sandpiper	e. Sandwich	iii. Habitat specialist	09. Common migrant	Sandwich Ramsar site
Charadriiformes	Scolopacidae	<i>Calidris</i>	<i>alba</i>	Sanderling	d. Boundinging	iii. Habitat specialist	09. Common migrant	Coast
Charadriiformes	Scolopacidae	<i>Limicola</i>	<i>falcinellus</i>	Broadbilled Sandpiper	e. Sandwich	iii. Habitat specialist	09. Common migrant	Sandwich Ramsar site
Charadriiformes	Scolopacidae	<i>Philomachus</i>	<i>pugnax</i>	Ruff	e. Sandwich	iii. Habitat specialist	09. Common migrant	Sandwich Ramsar site
Charadriiformes	Scolopacidae	<i>Limosa</i>	<i>lapponica</i>	Bartailed Godwit	e. Sandwich	iii. Habitat specialist	09. Common migrant	Sandwich Ramsar site
Charadriiformes	Scolopacidae	<i>Numenius</i>	<i>arquata</i>	Curlew	e. Sandwich	iii. Habitat specialist	09. Common migrant	Sandwich Ramsar site
Charadriiformes	Scolopacidae	<i>Numenius</i>	<i>phaeopus</i>	Whimbrel	d. Boundinging	iii. Habitat specialist	09. Common migrant	Coast
Charadriiformes	Scolopacidae	<i>Phalaropus</i>	<i>fulicarius</i>	Grey Phalarope	e. Sandwich	iii. Habitat specialist	10. Intermittent visitor	Sandwich Ramsar site, migrant
Charadriiformes	Scolopacidae	<i>Phalaropus</i>	<i>lobatus</i>	Rednecked Phalarope	e. Sandwich	iii. Habitat specialist	10. Intermittent visitor	Sandwich Ramsar site, migrant
Charadriiformes	Scolopacidae	<i>Phalaropus</i>	<i>tricolor</i>	Wilson's Phalarope	e. Sandwich	iii. Habitat specialist	10. Intermittent visitor	Sandwich Ramsar site, migrant

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Charadriiformes	Recurvirostridae	<i>Recurvirostra</i>	<i>avosetta</i>	Avocet	e. Sandwich	iii. Habitat specialist	07. Interdigitated resident	Sandwich Ramsar site
Charadriiformes	Recurvirostridae	<i>Himantopus</i>	<i>himantopus</i>	Blackwinged Stilt	e. Sandwich	iii. Habitat specialist	07. Interdigitated resident	Sandwich Ramsar site
Charadriiformes	Burhinidae	<i>Burhinus</i>	<i>capensis</i>	Spotted Dikkop	d. Bounding	iv. Generalist	07. Interdigitated resident	Eastern boundary
Charadriiformes	Glareolidae	<i>Cursorius</i>	<i>rufus</i>	Burchell's Courser	d. Bounding	iv. Generalist	08. Marginal presence	Eastern boundary
Charadriiformes	Glareolidae	<i>Cursorius</i>	<i>temminckii</i>	Temminck's Courser	d. Bounding	iv. Generalist	07. Interdigitated resident	Northeastern boundary
Charadriiformes	Glareolidae	<i>Rhinoptilus</i>	<i>africanus</i>	Doublebanded Courser	d. Bounding	iv. Generalist	07. Interdigitated resident	Eastern boundary
Charadriiformes	Laridae	<i>Stercorarius</i>	<i>parasiticus</i>	Arctic Skua	e. Sandwich	iii. Habitat specialist	09. Common migrant	Sandwich Ramsar site
Charadriiformes	Laridae	<i>Stercorarius</i>	<i>pomarinus</i>	Pomarine Skua	e. Sandwich	iii. Habitat specialist	09. Common migrant	Sandwich Ramsar site
Charadriiformes	Laridae	<i>Catharacta</i>	<i>antarctica</i>	Subantarctic Skua	d. Bounding	iii. Habitat specialist	09. Common migrant	Coast
Charadriiformes	Laridae	<i>Larus</i>	<i>dominicanus</i>	Kelp Gull	d. Bounding	iii. Habitat specialist	07. Interdigitated resident	Coast
Charadriiformes	Laridae	<i>Larus</i>	<i>cirrocephalus</i>	Greyheaded Gull	d. Bounding	iii. Habitat specialist	07. Interdigitated resident	Coast
Charadriiformes	Laridae	<i>Larus</i>	<i>hartlaubi</i>	Hartlaub's Gull	d. Bounding	iii. Habitat specialist	03. Near Endemic	Coast
Charadriiformes	Laridae	<i>Larus</i>	<i>ridibundus</i>	Blackheaded Gull	e. Sandwich	iii. Habitat specialist	10. Intermittent visitor	Sandwich Ramsar site, migrant
Charadriiformes	Laridae	<i>Hydroprogne</i>	<i>caspia</i>	Caspian Tern	d. Bounding	iii. Habitat specialist	09. Common migrant	Coast
Charadriiformes	Laridae	<i>Sterna</i>	<i>maxima</i>	Royal Tern	e. Sandwich	iii. Habitat specialist	10. Intermittent visitor	Sandwich Ramsar site, migrant
Charadriiformes	Laridae	<i>Sterna</i>	<i>bergii</i>	Swift Tern	d. Bounding	iii. Habitat specialist	07. Interdigitated resident	Coast
Charadriiformes	Laridae	<i>Sterna</i>	<i>sandvicensis</i>	Sandwich Tern	d. Bounding	iii. Habitat specialist	09. Common migrant	Coast
Charadriiformes	Laridae	<i>Sterna</i>	<i>hirundo</i>	Common Tern	d. Bounding	iii. Habitat specialist	09. Common migrant	Coast
Charadriiformes	Laridae	<i>Sterna</i>	<i>paradisaea</i>	Arctic Tern	d. Bounding	iii. Habitat specialist	09. Common migrant	Coast
Charadriiformes	Laridae	<i>Sterna</i>	<i>dougallii</i>	Roseate Tern	d. Bounding	iii. Habitat specialist	11. Vagrant	Coast
Charadriiformes	Laridae	<i>Sterna</i>	<i>balaenarum</i>	Damara Tern	d. Bounding	iii. Habitat specialist	03. Near Endemic	Coast
Charadriiformes	Laridae	<i>Chlidonias</i>	<i>niger</i>	Black Tern	e. Sandwich	iii. Habitat specialist	10. Intermittent visitor	Sandwich Ramsar site, migrant
Charadriiformes	Laridae	<i>Chlidonias</i>	<i>hybridus</i>	Whiskered Tern	e. Sandwich	iii. Habitat specialist	11. Vagrant	Sandwich Ramsar site

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Charadriiformes	Laridae	<i>Chlidonias</i>	<i>leucopterus</i>	Whitewinged Tern	e. Sandwich	iii. Habitat specialist	09. Common migrant	Sandwich Ramsar site
Pterocliiformes	Pteroclididae	<i>Pterocles</i>	<i>namaqua</i>	Namaqua Sandgrouse	c. Widespread	ii. Arid area specialist	04. Common Resident	Absent from coast
Pterocliiformes	Pteroclididae	<i>Pterocles</i>	<i>bicinctus</i>	Doublebanded Sandgrouse	d. Bounding	iv. Generalist	07. Interdigitated resident	Northeastern boundary
Columbiformes	Columbidae	<i>Columba</i>	<i>livia</i>	Feral Pigeon	d. Bounding	iv. Generalist	12. Alien	Sandwich Ramsar site, Kuiseb, Old mining towns
Columbiformes	Columbidae	<i>Columba</i>	<i>guinea</i>	Rock Pigeon	d. Bounding	iv. Generalist	07. Interdigitated resident	Inselbergs & eastern boundary
Columbiformes	Columbidae	<i>Streptopelia</i>	<i>capicola</i>	Cape Turtle Dove	d. Bounding	iv. Generalist	07. Interdigitated resident	Eastern boundary
Columbiformes	Columbidae	<i>Streptopelia</i>	<i>senegalensis</i>	Laughing Dove	d. Bounding	iv. Generalist	07. Interdigitated resident	Coastal Springs & eastern boundary
Columbiformes	Columbidae	<i>Oena</i>	<i>capensis</i>	Namaqua Dove	d. Bounding	iv. Generalist	07. Interdigitated resident	Coastal Springs & eastern boundary
Psittaciformes	Psittacidae	<i>Agapornis</i>	<i>roseicollis</i>	Rosy faced Lovebird	d. Bounding	iii. Habitat specialist	07. Interdigitated resident	Vertical cliffs and ephemeral rivers
Musophagiformes	Musophagidae	<i>Corythaixoides</i>	<i>concolor</i>	Grey Lourie	d. Bounding	iv. Generalist	07. Interdigitated resident	Northern & northeastern boundary
Cuculiformes	Cuculidae	<i>Cuculus</i>	<i>clamosus</i>	Black Cuckoo	d. Bounding	iii. Habitat specialist	10. Intermittent visitor	Central eastern boundary
Cuculiformes	Cuculidae	<i>Clamator</i>	<i>glandarius</i>	Great Spotted Cuckoo	d. Bounding	iii. Habitat specialist	10. Intermittent visitor	Central eastern boundary
Cuculiformes	Cuculidae	<i>Chrysococcyx</i>	<i>caprius</i>	Diederik Cuckoo	d. Bounding	iii. Habitat specialist	09. Common migrant	Northeastern boundary
Cuculiformes	Cuculidae	<i>Chrysococcyx</i>	<i>klaas</i>	Klaas's Cuckoo	d. Bounding	iii. Habitat specialist	10. Intermittent visitor	Central eastern boundary
Strigiformes	Tytonidae	<i>Tyto</i>	<i>alba</i>	Barn Owl	c. Widespread	iv. Generalist	07. Interdigitated resident	Inselbergs, ephemeral rivers, buildings
Strigiformes	Strigidae	<i>Asio</i>	<i>capensis</i>	Marsh Owl	e. Sandwich	iii. Habitat specialist	08. Marginal presence	Sandwich Ramsar site
Strigiformes	Strigidae	<i>Otus</i>	<i>senegalensis</i>	Scops Owl	d. Bounding	iv. Generalist	08. Marginal presence	Eastern boundary
Strigiformes	Strigidae	<i>Otus</i>	<i>leucotis</i>	Whitefaced Owl	c. Widespread	iv. Generalist	07. Interdigitated resident	Eastern boundary
Strigiformes	Strigidae	<i>Glaucidium</i>	<i>perlatum</i>	Pearlspotted Owl	c. Widespread	iv. Generalist	07. Interdigitated resident	Eastern boundary

Order	Family	Genus	Species	Common Name	NSS Biogeography	NSS Ecological range	NSS Status	Habitat within Property
Strigiformes	Strigidae	<i>Bubo</i>	<i>africanus</i>	Spotted Eagle Owl	d. Bounding	iv. Generalist	07. Interdigitated resident	Northern & eastern boundary
Strigiformes	Strigidae	<i>Bubo</i>	<i>lacteus</i>	Giant Eagle Owl	d. Bounding	iv. Generalist	10. Intermittent visitor	Northern & eastern boundary
Caprimulgiformes	Caprimulgidae	<i>Caprimulgus</i>	<i>europaeus</i>	European Nightjar	d. Bounding	iv. Generalist	09. Common migrant	Northeastern boundary
Caprimulgiformes	Caprimulgidae	<i>Caprimulgus</i>	<i>pectoralis</i>	Fierynecked Nightjar	d. Bounding	iv. Generalist	10. Intermittent visitor	Northeastern boundary
Caprimulgiformes	Caprimulgidae	<i>Caprimulgus</i>	<i>rufigena</i>	Rufouscheeked Nightjar	d. Bounding	iv. Generalist	10. Intermittent visitor	Northeastern boundary
Caprimulgiformes	Caprimulgidae	<i>Caprimulgus</i>	<i>tristigma</i>	Freckled Nightjar	d. Bounding	iv. Generalist	10. Intermittent visitor	Northeastern boundary
Apodiformes	Apodidae	<i>Apus</i>	<i>apus</i>	European Swift	d. Bounding	iv. Generalist	09. Common migrant	Eastern boundary
Apodiformes	Apodidae	<i>Apus</i>	<i>bradfieldi</i>	Bradfield's Swift	d. Bounding	ii. Arid area specialist	07. Interdigitated resident	Northern & eastern boundary
Apodiformes	Apodidae	<i>Apus</i>	<i>caffer</i>	Whiterumped Swift	d. Bounding	iv. Generalist	09. Common migrant	Northern & eastern boundary
Apodiformes	Apodidae	<i>Apus</i>	<i>affinis</i>	Little Swift	d. Bounding	iv. Generalist	10. Intermittent visitor	Northern & eastern boundary
Apodiformes	Apodidae	<i>Apus</i>	<i>melba</i>	Alpine Swift	d. Bounding	iv. Generalist	07. Interdigitated resident	Along all boundaries & coast
Coliiformes	Coliidae	<i>Colius</i>	<i>colius</i>	Whitebacked Mousebird	d. Bounding	iv. Generalist	07. Interdigitated resident	Eastern boundary
Coliiformes	Coliidae	<i>Urocolius</i>	<i>indicus</i>	Redfaced Mousebird	d. Bounding	iv. Generalist	07. Interdigitated resident	Northeastern boundary
Alcediniformes	Meropidae	<i>Merops</i>	<i>apiaster</i>	European Bee-eater	d. Bounding	iv. Generalist	10. Intermittent visitor	Eastern boundary, migrant
Alcediniformes	Meropidae	<i>Merops</i>	<i>hirundineus</i>	Swallowtailed Bee-eater	d. Bounding	iv. Generalist	07. Interdigitated resident	Northern & eastern boundary
Coraciiformes	Coraciidae	<i>Coracias</i>	<i>naevia</i>	Purple Roller	d. Bounding	iv. Generalist	10. Intermittent visitor	Eastern boundary
Coraciiformes	Upupidae	<i>Upupa</i>	<i>epops</i>	Hoopoe	d. Bounding	iv. Generalist	10. Intermittent visitor	Eastern boundary
Coraciiformes	Phoeniculidae	<i>Phoeniculus</i>	<i>cyanomelas</i>	Scimitar-billed Woodhoopoe	d. Bounding	iv. Generalist	07. Interdigitated resident	Northern & eastern boundary
Coraciiformes	Bucerotidae	<i>Tockus</i>	<i>nasatus</i>	Grey Hornbill	d. Bounding	iv. Generalist	08. Marginal presence	Eastern boundary

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Coraciiformes	Bucerotidae	<i>Tockus</i>	<i>erythrorhynchus</i>	Redbilled Hornbill	d. Bounding	iv. Generalist	08. Marginal presence	Eastern boundary
Coraciiformes	Bucerotidae	<i>Tockus</i>	<i>leucomelas</i>	Southern Yellowbilled Hornbill	d. Bounding	iv. Generalist	08. Marginal presence	Eastern boundary
Coraciiformes	Bucerotidae	<i>Tockus</i>	<i>monteiri</i>	Monteiro's Hornbill	d. Bounding	iv. Generalist	08. Marginal presence	Eastern boundary
Piciformes	Indicatoridae	<i>Indicator</i>	<i>minor</i>	Lesser Honeyguide	d. Bounding	iv. Generalist	07. Interdigitated resident	Eastern boundary
Piciformes	Capitonidae	<i>Lybius</i>	<i>leucomelas</i>	Pied Barbet	d. Bounding	iv. Generalist	07. Interdigitated resident	Eastern boundary
Piciformes	Picidae	<i>Campethera</i>	<i>abingoni</i>	Goldentailed Woodpecker	d. Bounding	iv. Generalist	07. Interdigitated resident	Eastern boundary
Piciformes	Picidae	<i>Dendropicos</i>	<i>fuscescens</i>	Cardinal Woodpecker	d. Bounding	iv. Generalist	07. Interdigitated resident	Eastern boundary
Passeriformes	Alaudidae	<i>Mirafra</i>	<i>passerina</i>	Monotonous Lark	d. Bounding	iv. Generalist	10. Intermittent visitor	Eastern boundary
Passeriformes	Alaudidae	<i>Mirafra</i>	<i>apiata</i>	Clapper Lark	d. Bounding	iv. Generalist	10. Intermittent visitor	Eastern boundary
Passeriformes	Alaudidae	<i>Mirafra</i>	<i>africanoides</i>	Fawncoloured Lark	d. Bounding	iv. Generalist	10. Intermittent visitor	Eastern boundary
Passeriformes	Alaudidae	<i>Mirafra</i>	<i>sabota</i>	Sabota Lark	d. Bounding	iv. Generalist	07. Interdigitated resident	Eastern boundary
Passeriformes	Alaudidae	<i>Mirafra</i>	<i>curvirostris</i>	Longbilled Lark	d. Bounding	iv. Generalist	07. Interdigitated resident	Eastern boundary
Passeriformes	Alaudidae	<i>Calendulauda</i>	<i>erythrochlamys</i>	Dune Lark	a. Sand Sea	i. Dune Sea specialist	01. Strict Endemic	Dunes
Passeriformes	Alaudidae	<i>Chersomanes</i>	<i>albofasciata</i>	Spikeheeled Lark	d. Bounding	iv. Generalist	07. Interdigitated resident	Eastern boundary
Passeriformes	Alaudidae	<i>Calandrella</i>	<i>cinerea</i>	Redcapped Lark	d. Bounding	iv. Generalist	06. Relict	Coastal salt flats
Passeriformes	Alaudidae	<i>Alauda</i>	<i>starki</i>	Stark's Lark	d. Bounding	ii. Arid area specialist	07. Interdigitated resident	Northern & eastern boundary
Passeriformes	Alaudidae	<i>Ammomanes</i>	<i>grayi</i>	Gray's Lark	c. Widespread	ii. Arid area specialist	03. Near Endemic	Northern boundary
Passeriformes	Alaudidae	<i>Eremopterix</i>	<i>verticalis</i>	Greybacked Sparrowlark	c. Widespread	iv. Generalist	04. Common Resident	Throughout area
Passeriformes	Alaudidae	<i>Eremopterix</i>	<i>australis</i>	Blackeared Sparrowlark	d. Bounding	iv. Generalist	10. Intermittent visitor	Southeast after good rain

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Passeriformes	Hirundinidae	<i>Hirundo</i>	<i>rustica</i>	Barn Swallow	c. Widespread	iv. Generalist	09. Common migrant	Throughout area
Passeriformes	Hirundinidae	<i>Hirundo</i>	<i>albigularis</i>	Whitethroated Swallow	c. Widespread	iv. Generalist	10. Intermittent visitor	Migrant
Passeriformes	Hirundinidae	<i>Hirundo</i>	<i>dimidiata</i>	Pearlbreasted Swallow	e. Sandwich	iii. Habitat specialist	09. Common migrant	Sandwich Ramsar site
Passeriformes	Hirundinidae	<i>Hirundo</i>	<i>cucullata</i>	Greater Striped Swallow	d. Boundinging	iv. Generalist	10. Intermittent visitor	Migrant
Passeriformes	Hirundinidae	<i>Hirundo</i>	<i>spilodera</i>	South African Cliff Swallow	c. Widespread	iv. Generalist	10. Intermittent visitor	Migrant
Passeriformes	Hirundinidae	<i>Hirundo</i>	<i>fuligula</i>	Rock Martin	d. Boundinging	iv. Generalist	07. Interdigitated resident	Eastern boundary
Passeriformes	Hirundinidae	<i>Delichon</i>	<i>urbica</i>	House Martin	d. Boundinging	iv. Generalist	10. Intermittent visitor	Migrant
Passeriformes	Hirundinidae	<i>Riparia</i>	<i>paludicola</i>	Brownthroated Martin	e. Sandwich	iv. Generalist	07. Interdigitated resident	Sandwich Ramsar site
Passeriformes	Hirundinidae	<i>Riparia</i>	<i>riparia</i>	Sand Martin	c. Widespread	iv. Generalist	09. Common migrant	Northern & eastern boundary
Passeriformes	Hirundinidae	<i>Riparia</i>	<i>cincta</i>	Banded Martin	e. Sandwich	iv. Generalist	09. Common migrant	Sandwich Ramsar site
Passeriformes	Dicruridae	<i>Dicrurus</i>	<i>adsimilis</i>	Forktailed Drongo	d. Boundinging	iv. Generalist	08. Marginal presence	Eastern boundary
Passeriformes	Oriolidae	<i>Oriolus</i>	<i>oriolus</i>	European Golden Oriole	d. Boundinging	iv. Generalist	10. Intermittent visitor	Ephemeral rivers, migrant
Passeriformes	Corvidae	<i>Corvus</i>	<i>capensis</i>	Black Crow	c. Widespread	iv. Generalist	04. Common Resident	Throughout area
Passeriformes	Corvidae	<i>Corvus</i>	<i>albus</i>	Pied Crow	c. Widespread	iv. Generalist	04. Common Resident	Throughout area
Passeriformes	Paridae	<i>Parus</i>	<i>cinerascens</i>	Ashy Tit	d. Boundinging	iv. Generalist	07. Interdigitated resident	Ephemeral rivers
Passeriformes	Paridae	<i>Parus</i>	<i>carpi</i>	Carp's Black Tit	d. Boundinging	iv. Generalist	10. Intermittent visitor	Eastern boundary
Passeriformes	Remizidae	<i>Anthoscopus</i>	<i>minutus</i>	Cape Penduline Tit	d. Boundinging	iv. Generalist	08. Marginal presence	Eastern boundary
Passeriformes	Pycnonotidae	<i>Pycnonotus</i>	<i>nigricans</i>	Redeyed Bulbul	d. Boundinging	iv. Generalist	07. Interdigitated resident	Eastern boundary
Passeriformes	Timaliidae	<i>Turdoides</i>	<i>bicolor</i>	Pied Babbler	d. Boundinging	iv. Generalist	10. Intermittent visitor	Northeastern boundary
Passeriformes	Turdidae	<i>Turdus</i>	<i>litsitsirupa</i>	Groundscraper Thrush	d. Boundinging	iv. Generalist	10. Intermittent visitor	Northeastern boundary

Order	Family	Genus	Species	Common Name	NSS Biogeography	NSS Ecological range	NSS Status	Habitat within Property
Passeriformes	Turdidae	<i>Monticola</i>	<i>breviceps</i>	Short-toed Rock Thrush	d. Bounding	iv. Generalist	08. Marginal presence	Eastern boundary
Passeriformes	Turdidae	<i>Oenanthe</i>	<i>monticola</i>	Mountain Chat	d. Bounding	iv. Generalist	10. Intermittent visitor	Eastern boundary
Passeriformes	Turdidae	<i>Oenanthe</i>	<i>pileata</i>	Capped Wheatear	d. Bounding	iv. Generalist	07. Interdigitated resident	Inselbergs & Eastern boundary
Passeriformes	Turdidae	<i>Cercomela</i>	<i>familiaris</i>	Familiar Chat	d. Bounding	iv. Generalist	07. Interdigitated resident	Inselbergs & Eastern boundary
Passeriformes	Turdidae	<i>Cercomela</i>	<i>tractrac</i>	Tractrac Chat	d. Bounding	ii. Arid area specialist	07. Interdigitated resident	Eastern boundary
Passeriformes	Turdidae	<i>Cercomela</i>	<i>schlegelii</i>	Karoo Chat	d. Bounding	ii. Arid area specialist	07. Interdigitated resident	Eastern boundary
Passeriformes	Turdidae	<i>Myrmecocichla</i>	<i>formicivora</i>	Anteating Chat	d. Bounding	iv. Generalist	10. Intermittent visitor	Eastern boundary
Passeriformes	Turdidae	<i>Erythropygia</i>	<i>coryphaeus</i>	Karoo Robin	d. Bounding	iv. Generalist	08. Marginal presence	Eastern boundary
Passeriformes	Turdidae	<i>Erythropygia</i>	<i>paena</i>	Kalahari Robin	d. Bounding	iv. Generalist	10. Intermittent visitor	Eastern boundary
Passeriformes	Turdidae	<i>Namibornis</i>	<i>herero</i>	Herero Chat	d. Bounding	ii. Arid area specialist	03. Near Endemic	Northeastern boundary
Passeriformes	Sylviidae	<i>Parisoma</i>	<i>subcaeruleum</i>	Titbabbler	d. Bounding	iv. Generalist	07. Interdigitated resident	Eastern boundary
Passeriformes	Sylviidae	<i>Parisoma</i>	<i>layardi</i>	Layards's Titbabbler	d. Bounding	ii. Arid area specialist	08. Marginal presence	Eastern boundary
Passeriformes	Sylviidae	<i>Sylvia</i>	<i>borin</i>	Garden Warbler	d. Bounding	iv. Generalist	10. Intermittent visitor	Migrant
Passeriformes	Sylviidae	<i>Hippolais</i>	<i>icterina</i>	Icterine Warbler	d. Bounding	iv. Generalist	09. Common migrant	Eastern boundary
Passeriformes	Sylviidae	<i>Acrocephalus</i>	<i>baeticatus</i>	African Marsh Warbler	e. Sandwich	iii. Habitat specialist	08. Marginal presence	Sandwich Ramsar site
Passeriformes	Sylviidae	<i>Acrocephalus</i>	<i>schoenobaenus</i>	European Sedge Warbler	e. Sandwich	iii. Habitat specialist	09. Common migrant	Sandwich Ramsar site
Passeriformes	Sylviidae	<i>Acrocephalus</i>	<i>gracilirostris</i>	Cape Reed warbler	e. Sandwich	iii. Habitat specialist	08. Marginal presence	Sandwich Ramsar site
Passeriformes	Sylviidae	<i>Phylloscopus</i>	<i>trochilus</i>	Willow Warbler	d. Bounding	iv. Generalist	10. Intermittent visitor	Eastern boundary, migrant
Passeriformes	Sylviidae	<i>Sylvietta</i>	<i>rufescens</i>	Longbilled Crombec	d. Bounding	iv. Generalist	08. Marginal presence	Eastern boundary

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Passeriformes	Sylviidae	<i>Eremomela</i>	<i>icteropygialis</i>	Yellowbellied Eremomela	d. Bounding	iv. Generalist	07. Interdigitated resident	Eastern boundary
Passeriformes	Sylviidae	<i>Eremomela</i>	<i>gregalis</i>	Karoo Eremomela	d. Bounding	ii. Arid area specialist	10. Intermittent visitor	Eastern boundary
Passeriformes	Sylviidae	<i>Euryptila</i>	<i>subcinnamomea</i>	Cinnamonbreasted Warbler	d. Bounding	ii. Arid area specialist	08. Marginal presence	Eastern boundary
Passeriformes	Sylviidae	<i>Achaetops</i>	<i>pyncopygius</i>	Rockrunner	d. Bounding	ii. Arid area specialist	08. Marginal presence	Eastern boundary
Passeriformes	Sylviidae	<i>Cisticola</i>	<i>juncidis</i>	Fantailed Cisticola	e. Sandwich	iii. Habitat specialist	08. Marginal presence	Sandwich Ramsar site
Passeriformes	Sylviidae	<i>Cisticola</i>	<i>aridula</i>	Desert Cisticola	d. Bounding	iv. Generalist	08. Marginal presence	Eastern boundary
Passeriformes	Sylviidae	<i>Cisticola</i>	<i>subruficapilla</i>	Greybacked Cisticola	d. Bounding	iv. Generalist	10. Intermittent visitor	Eastern boundary
Passeriformes	Sylviidae	<i>Prinia</i>	<i>flavicans</i>	Blackchedded Prinia	d. Bounding	iv. Generalist	07. Interdigitated resident	Eastern boundary
Passeriformes	Sylviidae	<i>Prinia</i>	<i>maculosa</i>	Spotted Prinia	d. Bounding	iv. Generalist	08. Marginal presence	southeasternmost rocky hills
Passeriformes	Sylviidae	<i>Malcorus</i>	<i>pectoralis</i>	Rufouseared Warbler	d. Bounding	ii. Arid area specialist	08. Marginal presence	Eastern boundary
Passeriformes	Muscicapidae	<i>Muscicapa</i>	<i>striata</i>	Spotted Flycatcher	d. Bounding	iv. Generalist	09. Common migrant	Eastern boundary & Sandwich Ramsar site
Passeriformes	Muscicapidae	<i>Melaenornis</i>	<i>mariquensis</i>	Marico Flycatcher	d. Bounding	iv. Generalist	08. Marginal presence	Eastern boundary
Passeriformes	Muscicapidae	<i>Melaenornis</i>	<i>infuscatus</i>	Chat Flycatcher	d. Bounding	iv. Generalist	07. Interdigitated resident	Eastern boundary
Passeriformes	Muscicapidae	<i>Batis</i>	<i>pririt</i>	Pririt Batis	d. Bounding	iv. Generalist	07. Interdigitated resident	Eastern boundary
Passeriformes	Motacillidae	<i>Motacilla</i>	<i>capensis</i>	Cape Wagtail	e. Sandwich	iii. Habitat specialist	07. Interdigitated resident	Coast and Eastern boundary
Passeriformes	Motacillidae	<i>Motacilla</i>	<i>aguimp</i>	African Pied Wagtail	e. Sandwich	iii. Habitat specialist	10. Intermittent visitor	Sandwich Ramsar site
Passeriformes	Motacillidae	<i>Motacilla</i>	<i>flava</i>	Yellow Wagtail	d. Bounding	iv. Generalist	10. Intermittent visitor	Eastern boundary
Passeriformes	Motacillidae	<i>Anthus</i>	<i>cinnamomeus</i>	Grassveld Pipit	d. Bounding	iv. Generalist	08. Marginal presence	Eastern boundary
Passeriformes	Motacillidae	<i>Anthus</i>	<i>trivialis</i>	Tree Pipit	d. Bounding	iv. Generalist	10. Intermittent visitor	Eastern boundary, migrant
Passeriformes	Motacillidae	<i>Anthus</i>	<i>similis</i>	Longbilled Pipit	d. Bounding	iv. Generalist	08. Marginal presence	Eastern boundary

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Passeriformes	Motacillidae	<i>Anthus</i>	<i>vaalensis</i>	Buffy Pipit	d. Bounding	iv. Generalist	10. Intermittent visitor	Eastern boundary
Passeriformes	Laniidae	<i>Lanius</i>	<i>minor</i>	Lesser Grey Shrike	d. Bounding	iv. Generalist	09. Common migrant	Eastern boundary, migrant
Passeriformes	Laniidae	<i>Lanius</i>	<i>collaris</i>	Fiscal Shrike	c. Widespread	iv. Generalist	07. Interdigitated resident	Northern & eastern boundary
Passeriformes	Malaconotidae	<i>Laniarius</i>	<i>atrococcineus</i>	Crimsonbreasted Shrike	d. Bounding	iv. Generalist	07. Interdigitated resident	Eastern boundary
Passeriformes	Malaconotidae	<i>Nilaus</i>	<i>afer</i>	Brubru	d. Bounding	iv. Generalist	07. Interdigitated resident	Eastern boundary
Passeriformes	Malaconotidae	<i>Tchagra</i>	<i>australis</i>	Three-streaked Tchagra	d. Bounding	iv. Generalist	08. Marginal presence	Eastern boundary
Passeriformes	Malaconotidae	<i>Telophorus</i>	<i>zeylonus</i>	Bokmakierie	d. Bounding	iv. Generalist	07. Interdigitated resident	Eastern boundary
Passeriformes	Malaconotidae	<i>Lanioturdus</i>	<i>torquatus</i>	Whitetailed Shrike	d. Bounding	ii. Arid area specialist	07. Interdigitated resident	Eastern boundary
Passeriformes	Sturnidae	<i>Creatophora</i>	<i>cinerea</i>	Wattled Starling	d. Bounding	iv. Generalist	07. Interdigitated resident	Eastern boundary & Sandwich Ramsar site
Passeriformes	Sturnidae	<i>Cinnyricinclus</i>	<i>leucogaster</i>	Plumcoloured Starling	d. Bounding	iv. Generalist	10. Intermittent visitor	Migrant
Passeriformes	Sturnidae	<i>Lamprotornis</i>	<i>nitens</i>	Glossy Starling	d. Bounding	iv. Generalist	08. Marginal presence	Eastern boundary
Passeriformes	Sturnidae	<i>Onychognathus</i>	<i>nabouroup</i>	Palewinged Starling	d. Bounding	ii. Arid area specialist	07. Interdigitated resident	Eastern boundary
Passeriformes	Nectariniidae	<i>Nectarinia</i>	<i>mariquensis</i>	Marico Sunbird	d. Bounding	iv. Generalist	08. Marginal presence	Eastern boundary
Passeriformes	Nectariniidae	<i>Nectarinia</i>	<i>fusca</i>	Dusky Sunbird	d. Bounding	ii. Arid area specialist	07. Interdigitated resident	Eastern boundary
Passeriformes	Nectariniidae	<i>Nectarinia</i>	<i>senegalensis</i>	Scarletched Sunbird	d. Bounding	iv. Generalist	08. Marginal presence	Eastern boundary
Passeriformes	Zosteropidae	<i>Zosterops</i>	<i>pallidus</i>	Cape White-eye	d. Bounding	iv. Generalist	08. Marginal presence	Northeastern boundary
Passeriformes	Ploceidae	<i>Plocepasser</i>	<i>mahali</i>	Whitebrowed Sparrow Weaver	d. Bounding	iv. Generalist	07. Interdigitated resident	Eastern boundary
Passeriformes	Ploceidae	<i>Philetairus</i>	<i>socius</i>	Sociable Weaver	d. Bounding	ii. Arid area specialist	07. Interdigitated resident	Eastern boundary
Passeriformes	Ploceidae	<i>Passer</i>	<i>domesticus</i>	House Sparrow	d. Bounding	iv. Generalist	12. Alien	Eastern boundary
Passeriformes	Ploceidae	<i>Passer</i>	<i>motitensis</i>	Great Sparrow	d. Bounding	iv. Generalist	08. Marginal presence	Eastern boundary

Order	Family	Genus	Species	Common Name	NSS Biogeography	NSS Ecological range	NSS Status	Habitat within Property
Passeriformes	Ploceidae	<i>Passer</i>	<i>melanurus</i>	Cape Sparrow	d. Bounding	iv. Generalist	07. Interdigitated resident	Eastern boundary
Passeriformes	Ploceidae	<i>Passer</i>	<i>diffusus</i>	Greyheaded Sparrow	d. Bounding	iv. Generalist	08. Marginal presence	Eastern boundary
Passeriformes	Ploceidae	<i>Sporopipes</i>	<i>squamifrons</i>	Scalyfeathered Finch	c. Widespread	iv. Generalist	07. Interdigitated resident	Absent from dunes and coast
Passeriformes	Ploceidae	<i>Ploceus</i>	<i>rubiginosus</i>	Chestnut Weaver	d. Bounding	ii. Arid area specialist	08. Marginal presence	Eastern boundary
Passeriformes	Ploceidae	<i>Ploceus</i>	<i>velatus</i>	Masked Weaver	d. Bounding	iv. Generalist	07. Interdigitated resident	Eastern boundary
Passeriformes	Ploceidae	<i>Quelea</i>	<i>quelea</i>	Redbilled Quelea	d. Bounding	iv. Generalist	08. Marginal presence	Sandwich Ramsar site, throughout grassland in good years
Passeriformes	Estrildidae	<i>Pytilia</i>	<i>melba</i>	Melba Finch	d. Bounding	iv. Generalist	10. Intermittent visitor	Eastern boundary
Passeriformes	Estrildidae	<i>Uraeginthus</i>	<i>granatinus</i>	Violeteared Waxbill	d. Bounding	iv. Generalist	10. Intermittent visitor	Eastern boundary
Passeriformes	Estrildidae	<i>Estrilda</i>	<i>astrild</i>	Common Waxbill	d. Bounding	iv. Generalist	10. Intermittent visitor	Eastern boundary
Passeriformes	Estrildidae	<i>Estrilda</i>	<i>erythronotos</i>	Blackcheeked Waxbill	d. Bounding	iv. Generalist	08. Marginal presence	Eastern boundary
Passeriformes	Estrildidae	<i>Amadina</i>	<i>erythrocephala</i>	Redheaded Finch	d. Bounding	iv. Generalist	07. Interdigitated resident	Eastern boundary
Passeriformes	Viduidae	<i>Vidua</i>	<i>regia</i>	Shafttailed Whydah	d. Bounding	iv. Generalist	08. Marginal presence	Eastern boundary
Passeriformes	Viduidae	<i>Vidua</i>	<i>macroura</i>	Pintailed Whydah	d. Bounding	iv. Generalist	08. Marginal presence	Central Eastern boundary
Passeriformes	Fringillidae	<i>Serinus</i>	<i>atrogularis</i>	Blackthroated Canary	d. Bounding	iv. Generalist	07. Interdigitated resident	Eastern boundary
Passeriformes	Fringillidae	<i>Serinus</i>	<i>alario</i>	Blackheaded Canary	d. Bounding	ii. Arid area specialist	07. Interdigitated resident	Eastern boundary
Passeriformes	Fringillidae	<i>Serinus</i>	<i>flaviventris</i>	Yellow Canary	d. Bounding	iv. Generalist	07. Interdigitated resident	Eastern boundary
Passeriformes	Fringillidae	<i>Serinus</i>	<i>albogularis</i>	Whitethroated Canary	d. Bounding	ii. Arid area specialist	07. Interdigitated resident	Eastern boundary
Passeriformes	Fringillidae	<i>Emberiza</i>	<i>capensis</i>	Cape Bunting	d. Bounding	iv. Generalist	08. Marginal presence	Eastern boundary

Order	Family	Genus	Species	Common Name	NSS Biogeography	NSS Ecological range	NSS Status	Habitat within Property
Passeriformes	Fringillidae	<i>Emberiza</i>	<i>tahapisi</i>	Rock Bunting	d. Bounding	iv. Generalist	08. Marginal presence	Eastern boundary
Passeriformes	Fringillidae	<i>Emberiza</i>	<i>impetuani</i>	Larklike Bunting	c. Widespread	ii. Arid area specialist	07. Interdigitated resident	Northern & eastern boundary

Annex 17

Table of Birds at Sandwich Harbour Ramsar Site



Namib Sand Sea Biogeography Biogeography description

- a. Sand Sea Sand Sea inhabitants rarely ranging outside dune habitats
- b. Inselbergs Petrophilous inselberg inhabitants occurring as isolated populations within the Sand Sea
- c. Widespread May inhabit any part of the property due to vagility and catholic ecological choice
- d. Boundinging Mostly found adjacent to the Sand Sea and contributing to biodiversity and ecology through suitable habitat inside the property, marginally intruding or absent from dunes
- e. Sandwich Ramsar Specific Sandwich Harbour Ramsar site inhabitants

Ecological range

- i. Dune Sea specialist
- ii. Arid area specialist
- iii. Habitat specialist
- iv. Generalist

Ecological range description

- Psammophilous species restricted to Namib Biome sand dunes
- Euryaceous species restricted to arid biome habitats
- Stenotypic species, habitat, host or prey specific
- Not habitat specific with wide ecological choice

Status

- 01. Strict Endemic
- 02. Dune Endemic
- 03. Near Endemic
- 04. Common Resident
- 05. Rare Resident
- 06. Relict
- 07. Interdigitated resident
- 08. Marginal presence
- 09. Common migrant
- 10. Intermittent visitor
- 11. Vagrant
- 12. Alien
- 13. Domesticated

Status Description

- Psammophilous species only found in Namib Sand Sea
- Psammophilous species in Namib Sand Sea, range extend to outhur Namib Biome dune areas
- Restricted to Namib Biomes
- Common throughout Namib Sand Sea property
- Rarely recorded from Namib Sand Sea property, not unexpected
- Isolated healthy populations in Namib Sand Sea far from core species range
- Readily found inside the property at suitable habitat intruding into the Sand Sea
- Incidental presence within the property from range overspill
- Present whenever conditions are suitable
- Rarely occur only when conditions are suitable
- Unusual and isolated records
- Feral populations of extralimital species
- Introduced alien species that is managed, occasionally vagrant

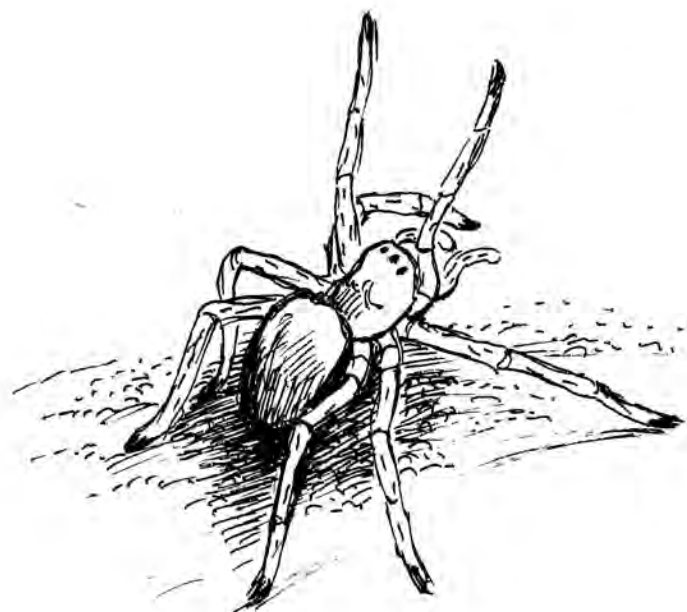
Family	Genus	Species	Common Name	Habitat within property
Podicipedidae	<i>Podiceps</i>	<i>cristatus</i>	Great Crested Grebe	Sandwich
Podicipedidae	<i>Tachybaptus</i>	<i>ruficollis</i>	Dabchick	Sandwich, pans with water
Podicipedidae	<i>Podiceps</i>	<i>nigricollis</i>	Blacknecked grebe	Sandwich
Pelecanidae	<i>Pelicanus</i>	<i>onocrotalus</i>	White Pelican	Sandwich
Pelecanidae	<i>Pelecanus</i>	<i>rufescens</i>	Pinkbacked Pelican	Sandwich
Phalacrocoracidae	<i>Phalacrocorax</i>	<i>africanus</i>	Reed Cormorant	Sandwich, migrant
Anhingidae	<i>Anhinga</i>	<i>melanogaster</i>	Darter	Sandwich, migrant
Ardeidae	<i>Ardea</i>	<i>cinerea</i>	Grey Heron	Sandwich
Ardeidae	<i>Ardea</i>	<i>melanocephala</i>	Blackheaded Heron	Sandwich, pans with water
Ardeidae	<i>Ardea</i>	<i>purpurea</i>	Purple Heron	Sandwich, migrant
Ardeidae	<i>Casmerodius</i>	<i>albus</i>	Great White Heron	Sandwich, migrant
Ardeidae	<i>Egretta</i>	<i>garzetta</i>	Little Egret	Sandwich
Ardeidae	<i>Egretta</i>	<i>intermedia</i>	Yellowbilled Egret	Sandwich, migrant
Ardeidae	<i>Ardeola</i>	<i>ralloides</i>	Squacco Heron	Vagrant
Ardeidae	<i>Nycticorax</i>	<i>nycticorax</i>	Blackcrowned Night Heron	Sandwich
Ardeidae	<i>Ixobrychys</i>	<i>sturmii</i>	Dwarf Bittern	Migrant
Ardeidae	<i>Ixobrychys</i>	<i>minutus</i>	Little Bittern	Migrant
Ciconiidae	<i>Ciconia</i>	<i>abdimii</i>	Abdim's Stork	Migrant
Ciconiidae	<i>Leptoptilos</i>	<i>crumeniferus</i>	Marabou Stork	Sandwich
Plataleidae	<i>Platalea</i>	<i>alba</i>	African Spoonbill	Sandwich
Phoenicopteridae	<i>Phoenicopterus</i>	<i>ruber</i>	Greater Flamingo	Sandwich
Phoenicopteridae	<i>Phoenicopterus</i>	<i>minor</i>	Lesser Flamingo	Sandwich
Anatidae	<i>Dendrocoryna</i>	<i>viduata</i>	Whitefaced Duck	Sandwich
Anatidae	<i>Thalassornis</i>	<i>leuconotus</i>	Whitebacked Duck	Sandwich
Anatidae	<i>Tadorna</i>	<i>cana</i>	South African Shelduck	Sandwich
Anatidae	<i>Anas</i>	<i>undulata</i>	Yellowbilled Duck	Sandwich, migrant
Anatidae	<i>Anas</i>	<i>hottentota</i>	Hottentot Teal	Rare migrant
Anatidae	<i>Plectropterus</i>	<i>gambensis</i>	Spurwinged Goose	Migrant
Anatidae	<i>Alopochen</i>	<i>aegytiacus</i>	Egyptian Goose	Sandwich, migrant
Anatidae	<i>Anas</i>	<i>capensis</i>	Cape Teal	Sandwich
Anatidae	<i>Anas</i>	<i>erythrorhyncha</i>	Redbilled Teal	Sandwich, migrant
Anatidae	<i>Anas</i>	<i>smithii</i>	Cape Shoveller	Sandwich, migrant
Anatidae	<i>Netta</i>	<i>erythrophthalma</i>	Southern Pochard	Sandwich
Anatidae	<i>Oxyura</i>	<i>maccoa</i>	Maccoa Duck	Sandwich
Accipitridae	<i>Buteo</i>	<i>rufofuscus</i>	Jackal Buzzard	Sandwich, Kuiseb treeline
Accipitridae	<i>Circus</i>	<i>ranivorus</i>	African Marsh Harrier	Isolated at Sandwich
Accipitridae	<i>Circus</i>	<i>maurus</i>	Black Harrier	Sandwich, migrant
Pandionidae	<i>Pandion</i>	<i>haliaetus</i>	Osprey	Sandwich, migrant
Rallidae	<i>Amaurornis</i>	<i>flavirostris</i>	Black Crake	Sandwich
Rallidae	<i>Porphyrio</i>	<i>porphyrio</i>	Purple Gallinule	Sandwich
Rallidae	<i>Gallinula</i>	<i>chloropus</i>	Moorhen	Sandwich
Rallidae	<i>Fulica</i>	<i>cristata</i>	Redknobbed Coot	Sandwich
Jacaniidae	<i>Actophilornis</i>	<i>africanus</i>	African Jacana	Vagrant
Haematopodidae	<i>Haematopus</i>	<i>moquini</i>	Black Oystercatcher	Coast
Charadriidae	<i>Charadrius</i>	<i>hiaticula</i>	Ringed Plover	Sandwich
Charadriidae	<i>Charadrius</i>	<i>marginatus</i>	Whitefronted Plover	Coast
Charadriidae	<i>Charadrius</i>	<i>pallidus</i>	Chestnutbanded Plover	Sandwich
Charadriidae	<i>Charadrius</i>	<i>pecuarius</i>	Kittlitz's Plover	Coast
Charadriidae	<i>Charadrius</i>	<i>tricoloris</i>	Threebanded Plover	Sandwich, pans with water
Charadriidae	<i>Charadrius</i>	<i>leschenaultii</i>	Sand Plover	Sandwich
Charadriidae	<i>Charadrius</i>	<i>asiaticus</i>	Caspian Plover	Sandwich
Charadriidae	<i>Pluvialis</i>	<i>squatarola</i>	Grey Plover	Coast
Charadriidae	<i>Vanellus</i>	<i>coronatus</i>	Crowned Plover	Sandwich, pans with water
Charadriidae	<i>Vanellus</i>	<i>armatus</i>	Blacksmith Plover	Sandwich, pans with water
Scolopacidae	<i>Arenaria</i>	<i>interpres</i>	Turnstone	Coast

Family	Genus	Species	Common Name	Habitat within property
Scolopacidae	<i>Xenus</i>	<i>cinereus</i>	Terek Sandpiper	Sandwich
Scolopacidae	<i>Tringa</i>	<i>hypoleucos</i>	Common Sandpiper	Sandwich
Scolopacidae	<i>Tringa</i>	<i>glareola</i>	Wood Sandpiper	Sandwich
Scolopacidae	<i>Tringa</i>	<i>totanus</i>	Redshank	Sandwich
Scolopacidae	<i>Tringa</i>	<i>stagnatilis</i>	Marsh Sandpiper	Sandwich
Scolopacidae	<i>Tringa</i>	<i>nebularia</i>	Greenshank	Sandwich
Scolopacidae	<i>Calidris</i>	<i>canatus</i>	Knot	Sandwich
Scolopacidae	<i>Calidris</i>	<i>ferruginea</i>	Curlew Sandpiper	Sandwich
Scolopacidae	<i>Calidris</i>	<i>minuta</i>	Little Stint	Sandwich
Scolopacidae	<i>Calidris</i>	<i>bairdii</i>	Baird's Sandpiper	Sandwich
Scolopacidae	<i>Calidris</i>	<i>melanotos</i>	Pectoral Sandpiper	Sandwich
Scolopacidae	<i>Calidris</i>	<i>alba</i>	Sanderling	Coast
Scolopacidae	<i>Limicola</i>	<i>falcinellus</i>	Broadbilled Sandpiper	Sandwich
Scolopacidae	<i>Philomachus</i>	<i>pugnax</i>	Ruff	Sandwich
Scolopacidae	<i>Limosa</i>	<i>lapponica</i>	Bartailed Godwit	Sandwich
Scolopacidae	<i>Numenius</i>	<i>arquata</i>	Curlew	Sandwich
Scolopacidae	<i>Numenius</i>	<i>phaeopus</i>	Whimbrel	Coast
Scolopacidae	<i>Phalaropus</i>	<i>fulcarius</i>	Grey Phalarope	Sandwich, migrant
Scolopacidae	<i>Phalaropus</i>	<i>lobatus</i>	Rednecked Phalarope	Sandwich, migrant
Scolopacidae	<i>Phalaropus</i>	<i>tricolor</i>	Wilson's Phalarope	Sandwich, migrant
Recurvirostridae	<i>Recurvirostra</i>	<i>avosetta</i>	Avocet	Sandwich
Recurvirostridae	<i>Himantopus</i>	<i>himantopus</i>	Blackwinged Stilt	Sandwich
Laridae	<i>Stercorarius</i>	<i>parasiticus</i>	Arctic Skua	Sandwich
Laridae	<i>Stercorarius</i>	<i>pomarinus</i>	Pomarine Skua	Sandwich
Laridae	<i>Catharacta</i>	<i>antarctica</i>	Subantarctic Skua	Coast
Laridae	<i>Larus</i>	<i>dominicanus</i>	Kelp Gull	Coast
Laridae	<i>Larus</i>	<i>cirrocephalus</i>	Greyheaded Gull	Coast
Laridae	<i>Larus</i>	<i>hartlaubi</i>	Hartlaub's Gull	Coast
Laridae	<i>Larus</i>	<i>ridibundus</i>	Blackheaded Gull	Sandwich, migrant
Laridae	<i>Hydroprogne</i>	<i>caspia</i>	Caspian Tern	Coast
Laridae	<i>Sterna</i>	<i>maxima</i>	Royal Tern	Sandwich, migrant
Laridae	<i>Sterna</i>	<i>bergii</i>	Swift Tern	Coast
Laridae	<i>Sterna</i>	<i>sandvicensis</i>	Sandwich Tern	Coast
Laridae	<i>Sterna</i>	<i>hirundo</i>	Common Tern	Coast
Laridae	<i>Sterna</i>	<i>paradisaea</i>	Arctic Tern	Coast
Laridae	<i>Sterna</i>	<i>dougallii</i>	Roseate Tern	Coast
Laridae	<i>Sterna</i>	<i>balaenarum</i>	Damara Tern	Coast
Laridae	<i>Chlidonias</i>	<i>niger</i>	Black Tern	Sandwich, migrant
Laridae	<i>Chlidonias</i>	<i>hybridus</i>	Whiskered Tern	Sandwich
Laridae	<i>Chlidonias</i>	<i>leucopterus</i>	Whitewinged Tern	Sandwich
Strigidae	<i>Asio</i>	<i>capensis</i>	Marsh Owl	Sandwich
Strigidae	<i>Otus</i>	<i>senegalensis</i>	Scops Owl	Widespread
Apodidae	<i>Apus</i>	<i>melba</i>	Alpine Swift	Migrant
Hirundinidae	<i>Hirundo</i>	<i>rustica</i>	European Swallow	Migrant
Hirundinidae	<i>Hirundo</i>	<i>albigularis</i>	Whitethroated Swallow	Migrant
Hirundinidae	<i>Hirundo</i>	<i>dimidiata</i>	Pearlbreasted Swallow	Sandwich
Hirundinidae	<i>Hirundo</i>	<i>cucullata</i>	Greater Striped Swallow	Migrant
Hirundinidae	<i>Riparia</i>	<i>paludicola</i>	Brownthroated Martin	Sandwich
Hirundinidae	<i>Riparia</i>	<i>riparia</i>	Sand Martin	Migrant
Hirundinidae	<i>Riparia</i>	<i>cincta</i>	Banded Martin	Sandwich
Sylviidae	<i>Sylvia</i>	<i>borin</i>	Garden Warbler	Migrant
Sylviidae	<i>Hippolais</i>	<i>icterina</i>	Icterine Warbler	Eastern boundary
Sylviidae	<i>Acrocephalus</i>	<i>baeticatus</i>	African Marsh Warbler	Sandwich
Sylviidae	<i>Acrocephalus</i>	<i>schoenobaenus</i>	European Sedge Warbler	Sandwich
Sylviidae	<i>Acrocephalus</i>	<i>gracillirostris</i>	Cape Reed warbler	Sandwich

Family	Genus	Species	Common Name	Habitat within property
Sylviidae	<i>Phylloscopus</i>	<i>trochilus</i>	Willow Warbler	Migrant
Sylviidae	<i>Cisticola</i>	<i>juncidis</i>	Fantailed Cisticola	Sandwich
Muscicapidae	<i>Muscicapa</i>	<i>striata</i>	Spotted Flycatcher	Sandwich, treelines
Motacillidae	<i>Motacilla</i>	<i>capensis</i>	Cape Wagtail	Coast and Eastern boundary
Motacillidae	<i>Motacilla</i>	<i>aguimp</i>	African Pied Wagtail	Sandwich
Sturnidae	<i>Creatophora</i>	<i>cinerea</i>	Wattled Starling	Sandwich, treelines
Ploceidae	<i>Quelea</i>	<i>quelea</i>	Redbilled Quelea	Sandwich, pans with water

Annex 18

Table of Sand Sea Inhabitants & Endemics



Namib Sand Sea Biogeography Biogeography description

- a. Sand Sea Sand Sea inhabitants rarely ranging outside dune habitats
- b. Inselbergs Petrophilous inselberg inhabitants occurring as isolated populations within the Sand Sea
- c. Widespread May inhabit any part of the property due to vagility and catholic ecological choice
- d. Boundinging Mostly found adjacent to the Sand Sea and contributing to biodiversity and ecology through suitable habitat inside the property, marginally intruding or absent from dunes
- e. Sandwich Ramsar Specific Sandwich Harbour Ramsar site inhabitants

Ecological range

- i. Dune Sea specialist
- ii. Arid area specialist
- iii. Habitat specialist
- iv. Generalist

Ecological range description

- Psammophilous species restricted to Namib Biome sand dunes
- Euryaceous species restricted to arid biome habitats
- Stenotypic species, habitat, host or prey specific
- Not habitat specific with wide ecological choice

Status

- 01. Strict Endemic
- 02. Dune Endemic
- 03. Near Endemic
- 04. Common Resident
- 05. Rare Resident
- 06. Relict
- 07. Interdigitated resident
- 08. Marginal presence
- 09. Common migrant
- 10. Intermittent visitor
- 11. Vagrant
- 12. Alien
- 13. Domesticated

Status Description

- Psammophilous species only found in Namib Sand Sea
- Psammophilous species in Namib Sand Sea, range extend to outhter Namib Biome dune areas
- Restricted to Namib Biomes
- Common throughout Namib Sand Sea property
- Rarely recorded from Namib Sand Sea property, not unexpected
- Isolated healthy populations in Namib Sand Sea far from core species range
- Readily found inside the property at suitable habitat intruding into the Sand Sea
- Incidental presence within the property from range overspill
- Present whenever conditions are suitable
- Rarely occur only when conditions are suitable
- Unusual and isolated records
- Feral populations of extralimital species
- Introduced alien species that is managed, occasionally vagrant

Order	Family	Genus	Species	Common Name	NSS Biogeography	NSS Ecological range
Kingdom: Plantae	Phylum: Magnoliophyta	Class: Magnoliatae		DICOTYLEDONS		
Geraniales	Geraniaceae	<i>Monsonia</i>	<i>ignorata</i>		i. Dune Sea specialist	02. Dune Endemic
Lamiales	Pedaliaceae	<i>Sesamum</i>	<i>abbreviatum</i>		i. Dune Sea specialist	02. Dune Endemic
Malvales	Sterculiaceae	<i>Hermannia</i>	<i>minimifolia</i>		i. Dune Sea specialist	02. Dune Endemic
Caryophyllales	Aizoaceae	<i>Trianthema</i>	<i>hereroensis</i>		i. Dune Sea specialist	03. Near Endemic
Cucurbitales	Cucurbitaceae	<i>Acanthosicyos</i>	<i>horridus</i>	Inara	i. Dune Sea specialist	03. Near Endemic
Fabales	Fabaceae	<i>Acacia</i>	<i>erioloba</i>	Camelthorn Tree	c. Widespread	04. Common Resident
Kingdom: Plantae	Phylum: Magnoliophyta	Class: Liliopsida		MONOCOTS		
Colchicales	Colchicaceae	<i>Hexacyrtis</i>	<i>dickiana</i>		i. Dune Sea specialist	02. Dune Endemic
Poales	Poaceae	<i>Stipagrostis</i>	<i>peilytronis</i>		i. Dune Sea specialist	02. Dune Endemic
Poales	Poaceae	<i>Stipagrostis</i>	<i>seelyae</i>		i. Dune Sea specialist	02. Dune Endemic
Poales	Poaceae	<i>Stipagrostis</i>	<i>gonatostachys</i>		i. Dune Sea specialist	02. Dune Endemic
Poales	Poaceae	<i>Stipagrostis</i>	<i>sabulicola</i>		i. Dune Sea specialist	02. Dune Endemic
Poales	Poaceae	<i>Centropodia</i>	<i>glauca</i>		i. Dune Sea specialist	04. Common Resident
Poales	Poaceae	<i>Cladoraphis</i>	<i>spinosa</i>		i. Dune Sea specialist	04. Common Resident
Poales	Poaceae	<i>Stipagrostis</i>	<i>lutescens</i>		i. Dune Sea specialist	04. Common Resident
Poales	Poaceae	<i>Schmidtia</i>	<i>kalahariensis</i>		c. Widespread	04. Common Resident
Kingdom: Animalia	Phylum: Chordata	Class: Mammalia		MAMMALS		
Rodentia	Muridae	<i>Gerbillurus</i>	<i>tytonis</i>	Dune Hairy-footed Gerbil	i. Dune Sea specialist	01. Strict Endemic
Afrosoricida	Chrysochloridae	<i>Eremitalpa</i>	<i>granti namibensis</i>	Grant's Golden Mole	i. Dune Sea specialist	02. Dune Endemic
Carnivora	Canidae	<i>Canis</i>	<i>mesomelas</i>	Black-backed Jackal	c. Widespread	04. Common Resident
Carnivora	Canidae	<i>Vulpes</i>	<i>chama</i>	Cape Fox	c. Widespread	04. Common Resident
Carnivora	Hyaenidae	<i>Crocuta</i>	<i>crocuta</i>	Spotted Hyaena	c. Widespread	04. Common Resident
Carnivora	Hyaenidae	<i>Parahyaena</i>	<i>brunnea</i>	Brown Hyaena	c. Widespread	04. Common Resident
Lagomorpha	Leporidae	<i>Lepus</i>	<i>capensis</i>	Cape Hare	c. Widespread	04. Common Resident
Rodentia	Muridae	<i>Rhabdomys</i>	<i>pumilio</i>	Four-striped Grass Mouse	c. Widespread	04. Common Resident
Ruminantia	Bovidae	<i>Antidorcas</i>	<i>marsupialis</i>	Springbok	c. Widespread	04. Common Resident
Ruminantia	Bovidae	<i>Oryx</i>	<i>gazella</i>	Gemsbok	c. Widespread	04. Common Resident
Carnivora	Felidae	<i>Felis</i>	<i>silvestris</i>	African Wild Cat	c. Widespread	05. Rare Resident
Chiroptera	Molossidae	<i>Tadarida</i>	<i>aegyptiaca</i>	Egyptian Free-tailed Bat	c. Widespread	07. Interdigitated resident
Chiroptera	Nycteridae	<i>Nycteris</i>	<i>thebaica</i>	Egyptian Slit-faced Bat	c. Widespread	07. Interdigitated resident
Kingdom: Animalia	Phylum: Chordata	Class: Aves		BIRDS		
Passeriformes	Alaudidae	<i>Certhilauda</i>	<i>erythrochlamys</i>	Dune Lark	i. Dune Sea specialist	01. Strict Endemic
Passeriformes	Alaudidae	<i>Ammomanes</i>	<i>grayi</i>	Gray's Lark	ii. Arid area specialist	03. Near Endemic
Falconiformes	Accipitridae	<i>Melierax</i>	<i>canorus</i>	Pale Chanting Goshawk	ii. Arid area specialist	04. Common Resident
Passeriformes	Alaudidae	<i>Eremopterix</i>	<i>verticalis</i>	Greybacked Sparrowlark	c. Widespread	04. Common Resident
Passeriformes	Corvidae	<i>Corvus</i>	<i>albus</i>	Pied Crow	c. Widespread	04. Common Resident

Order	Family	Genus	Species	Common Name	NSS Biogeography	NSS Ecological range
Passeriformes	Corvidae	<i>Corvus</i>	<i>capensis</i>	Black Crow	c. Widespread	04. Common Resident
Pterocloriformes	Pteroclididae	<i>Pterocles</i>	<i>namaqua</i>	Namaqua Sandgrouse	ii. Arid area specialist	04. Common Resident
Struthioniformes	Struthionidae	<i>Struthio</i>	<i>camelus</i>	Ostrich	c. Widespread	04. Common Resident
Passeriformes	Alaudidae	<i>Calandrella</i>	<i>cinerea</i>	Redcapped Lark	Coastal salt flats	06. Relict
Kingdom: Animalia	Phylum: Chordata	Class: Reptilia		REPTILES		
Squamata	Gekkonidae	<i>Ptenopus</i>	<i>kochi</i>	Koch's Barking Gecko	Interdune river silts	01. Strict Endemic
Squamata	Lacertidae	<i>Meroles</i>	<i>micropholidotus</i>	Small-scaled Desert Lizard	Fogbound Dune Sea	01. Strict Endemic
Squamata	Scincidae	<i>Typhlosaurus</i>	<i>braini</i>	Brain's Blind Legless Skink	i. Dune Sea specialist	01. Strict Endemic
Squamata	Gekkonidae	<i>Palmatogecko</i>	<i>rangei</i>	Web-footed gecko	i. Dune Sea specialist	02. Dune Endemic
Squamata	Gerrhosauridae	<i>Cordylosaurus</i>	<i>subtessellatus</i>	Dwarf Plated Lizard	b. Inselbergs	03. Endemic relict
Squamata	Lacertidae	<i>Meroles</i>	<i>anchietae</i>	Shovel-snouted Lizard	i. Dune Sea specialist	02. Dune Endemic
Squamata	Lacertidae	<i>Meroles</i>	<i>cuneirostris</i>	Wedge-snouted Desert Lizard	i. Dune Sea specialist	02. Dune Endemic
Squamata	Scincidae	<i>Typhlacontias</i>	<i>brevipes</i>	Fitzsimons' Burrowing Skink	Fogbound Dunes	02. Dune Endemic
Squamata	Viperidae	<i>Bitis</i>	<i>peringueyi</i>	Sidewinder Adder	i. Dune Sea specialist	02. Dune Endemic
Squamata	Colubridae	<i>Psammophis</i>	<i>leightoni namibensis</i>	Namib Sand Snake	c. Widespread	03. Near Endemic
Squamata	Elapidae	<i>Aspidelaps</i>	<i>lubricus infuscatus</i>	Coral snake	ii. Arid area specialist	03. Near Endemic
Squamata	Lacertidae	<i>Meroles</i>	<i>reticulatus</i>	Reticulated Desert Lizard	Northwestern Coastal hummocks	03. Near Endemic
Squamata	Leptotyphlopidae	<i>Leptotyphlops</i>	<i>occidentalis</i>	Western Thread Snake	i. Dune Sea specialist	03. Near Endemic
Squamata	Chamaeleonidae	<i>Chamaeleo</i>	<i>namaquensis</i>	Namaqua Chameleon	c. Widespread	04. Common Resident
Squamata	Colubridae	<i>Dipsina</i>	<i>multimaculata</i>	Dwarf Beaked Snake	c. Widespread	04. Common Resident
Squamata	Lacertidae	<i>Meroles</i>	<i>suborbitalis</i>	Spotted Desert Lizard	c. Widespread	04. Common Resident
Squamata	Lacertidae	<i>Pedioplanis</i>	<i>namaquensis</i>	Namaqua Sand Lizard	c. Widespread	04. Common Resident
Squamata	Scincidae	<i>Mabuya</i>	<i>variegata</i>	Variegated Skink	c. Widespread	04. Common Resident
Kingdom: Animalia	Phylum: Arthropoda	Class: Chilopoda		CENTIPEDES		
Geophilida	Oryidae	<i>Aspidopleres</i>	<i>intercalatus</i>		iii. Habitat specialist	04. Common Resident
Geophilida	Oryidae	<i>Diphtherogaster</i>	<i>flavus</i>		iii. Habitat specialist	04. Common Resident
Scolopendrida	Scolopendridae	<i>Cormocephalus</i>	<i>deventeri</i>		c. Widespread	04. Common Resident
Scolopendrida	Scolopendridae	<i>Trachycormocephalus</i>	<i>occidentalis</i>		c. Widespread	04. Common Resident
Scolopendrida	Scolopendridae	<i>Scolopendra</i>	<i>morsitans</i>		c. Widespread	04. Common Resident
Kingdom: Animalia	Phylum: Arthropoda	Class: Chelicerata		SPIDERS, SCORPIONS, SOLIFUGES		
Araneae	Eresidae	<i>Seothyra</i>	<i>henscheli</i>		i. Dune Sea specialist	01. Strict Endemic
Araneae	Palpimanidae	<i>Palpimanus</i>	<i>stridulator</i>		i. Dune Sea specialist	01. Strict Endemic
Araneae	Sparassidae	<i>Carparachne</i>	<i>alba</i>		i. Dune Sea specialist	01. Strict Endemic
Araneae	Sparassidae	<i>Carparachne</i>	<i>aureoflava</i>		i. Dune Sea specialist	01. Strict Endemic
Araneae	Sparassidae	<i>Leucorchestris</i>	<i>arenicola</i>		i. Dune Sea specialist	01. Strict Endemic
Araneae	Sparassidae	<i>Microrchestris</i>	<i>melanogaster</i>		i. Dune Sea specialist	01. Strict Endemic
Araneae	Sparassidae	<i>Orchestrella</i>	<i>browni</i>		i. Dune Sea specialist	01. Strict Endemic

Order	Family	Genus	Species	Common Name	NSS Biogeography	NSS Ecological range
Araneae	Sparassidae	<i>Orchestrella</i>	<i>caroli</i>		i. Dune Sea specialist	01. Strict Endemic
Araneae	Sparassidae	<i>Orchestrella</i>	<i>longipes</i>		i. Dune Sea specialist	01. Strict Endemic
Scorpiones	Scorpionidae	<i>Opisthophthalmus</i>	<i>flavescens</i>		i. Dune Sea specialist	01. Strict Endemic
Solifugae	Daesiidae	<i>Blossia</i>	<i>falcifera namibensis</i>		ii. Arid area specialist	01. Strict Endemic
Solifugae	Daesiidae	<i>Blossia</i>	<i>rooica</i>		ii. Arid area specialist	01. Strict Endemic
Solifugae	Daesiidae	<i>Blossia</i>	<i>sabulosa</i>		ii. Arid area specialist	01. Strict Endemic
Solifugae	Daesiidae	<i>Eberlanzia</i>	<i>flava trilineata</i>		ii. Arid area specialist	01. Strict Endemic
Solifugae	Daesiidae	<i>Namibesia</i>	<i>pallida</i>		ii. Arid area specialist	01. Strict Endemic
Solifugae	Hexisopodidae	<i>Hexisopus</i>	<i>nigroplagiatus</i>		iii. Habitat specialist	01. Strict Endemic
Solifugae	Hexisopodidae	<i>Hexisopus</i>	<i>psammophilus</i>		iii. Habitat specialist	01. Strict Endemic
Solifugae	Hexisopodidae	<i>Mossamedessa</i>	<i>eberlanzi</i>		iii. Habitat specialist	01. Strict Endemic
Solifugae	Hexisopodidae	<i>Siloana</i>	<i>eberlanzi</i>		iii. Habitat specialist	01. Strict Endemic
Solifugae	Karschiidae	<i>Lipophaga</i>	<i>michaelseni</i>		i. Dune Sea specialist	01. Strict Endemic
Solifugae	Melanoblossidae	<i>Lawrencega</i>	<i>longitarsis</i>		i. Dune Sea specialist	01. Strict Endemic
Solifugae	Melanoblossidae	<i>Lawrencega</i>	<i>minuta</i>		i. Dune Sea specialist	01. Strict Endemic
Solifugae	Melanoblossidae	<i>Lawrencega</i>	<i>solaris</i>		i. Dune Sea specialist	01. Strict Endemic
Solifugae	Melanoblossidae	<i>Microblossia</i>	<i>eberlanzi</i>		i. Dune Sea specialist	01. Strict Endemic
Solifugae	Melanoblossidae	<i>Unguiblossia</i>	<i>eberlanzi</i>		i. Dune Sea specialist	01. Strict Endemic
Solifugae	Solpugidae	<i>Solpuga</i>	<i>lateralis</i>		i. Dune Sea specialist	01. Strict Endemic
Araneae	Ammoxenidae	<i>Rastellus</i>	<i>sabulosus</i>		iii. Habitat specialist	02. Dune Endemic
Araneae	Gnaphosidae	<i>Camillina</i>	<i>namibensis</i>		i. Dune Sea specialist	02. Dune Endemic
Araneae	Sparassidae	<i>Leucorchestris</i>	<i>sabulosa</i>		i. Dune Sea specialist	02. Dune Endemic
Araneae	Sparassidae	<i>Microrchestris</i>	<i>scutatus</i>		i. Dune Sea specialist	02. Dune Endemic
Araneae	Zodariidae	<i>Psammoduon</i>	<i>deserticola</i>		i. Dune Sea specialist	02. Dune Endemic
Scorpiones	Scorpionidae	<i>Opisthophthalmus</i>	<i>holmi</i>		i. Dune Sea specialist	02. Dune Endemic
Solifugae	Hexisopodidae	<i>Hexisopus</i>	<i>infuscatus</i>		iii. Habitat specialist	02. Dune Endemic
Araneae	Theridiidae	<i>Latrodectus</i>	<i>renivulvatus</i>		Coastal areas	02. Dune Endemic
Solifugae	Ceromidae	<i>Ceroma</i>	<i>inerme</i>		Coastal littoral	02. Dune Endemic
Scorpiones	Buthidae	<i>Parabuthus</i>	<i>namibensis</i>		From Conception bay north	03. Near Endemic
Solifugae	Hexisopodidae	<i>Hexisopus</i>	<i>pusillus</i>		iii. Habitat specialist	03. Near Endemic
Araneae	Ammoxenidae	<i>Ammoxenus</i>	<i>coccineus</i>		c. Widespread	04. Common Resident
Araneae	Pholcidae	<i>Smeringopus</i>	<i>atomarius</i>		c. Widespread	04. Common Resident
Scorpiones	Buthidae	<i>Parabuthus</i>	<i>brevimanus</i>		c. Widespread	04. Common Resident
Scorpiones	Buthidae	<i>Parabuthus</i>	<i>granulatus</i>		c. Widespread	04. Common Resident
Scorpiones	Scorpionidae	<i>Opisthophthalmus</i>	<i>wahlbergi</i>		c. Widespread	04. Common Resident
Solifugae	Melanoblossidae	<i>Unguiblossia</i>	<i>cauduliger</i>		c. Widespread	04. Common Resident
Solifugae	Solpugidae	<i>Solpuga</i>	<i>venator</i>		c. Widespread	04. Common Resident

Order	Family	Genus	Species	Common Name	NSS Biogeography	NSS Ecological range
Kingdom: Animalia	Phylum: Arthropoda	Class: Insecta		INSECTS		
Archaeognatha	Meinertellidae	<i>Machiloides</i>	<i>sp.</i>		b. Inselbergs	iv. Generalist
Thysanura	Lepismatidae	<i>Ctenolepisma</i>	<i>detritus</i>		a. Sand Sea	i. Dune Sea specialist
Thysanura	Lepismatidae	<i>Ctenolepisma</i>	<i>spinipes</i>		a. Sand Sea	i. Dune Sea specialist
Thysanura	Lepismatidae	<i>Mormisma</i>	<i>wygodzinskyi</i>		a. Sand Sea	i. Dune Sea specialist
Thysanura	Lepismatidae	<i>Namibmormisma</i>	<i>muricaudata</i>		a. Sand Sea	i. Dune Sea specialist
Thysanura	Lepismatidae	<i>Namibmormisma</i>	<i>setosa</i>		a. Sand Sea	i. Dune Sea specialist
Thysanura	Lepismatidae	<i>Nebkhalepisma</i>	<i>australis</i>		a. Sand Sea	i. Dune Sea specialist
Thysanura	Lepismatidae	<i>Ornatilepisma</i>	<i>horni</i>		a. Sand Sea	i. Dune Sea specialist
Thysanura	Lepismatidae	<i>Ctenolepisma</i>	<i>arenicola</i>		a. Sand Sea	i. Dune Sea specialist
Thysanura	Lepismatidae	<i>Ctenolepisma</i>	<i>pauliani</i>		a. Sand Sea	i. Dune Sea specialist
Thysanura	Lepismatidae	<i>Gopsilepisma</i>	<i>verecunda</i>		a. Sand Sea	i. Dune Sea specialist
Thysanura	Lepismatidae	<i>Sabulepisma</i>	<i>multiformis</i>		a. Sand Sea	i. Dune Sea specialist
Thysanura	Lepismatidae	<i>Swalepisma</i>	<i>mirabilis</i>		a. Sand Sea	i. Dune Sea specialist
Thysanura	Lepismatidae	<i>Monachina</i>	<i>stilifera</i>		a. Sand Sea	i. Dune Sea specialist
Thysanura	Lepismatidae	<i>Thermobia</i>	<i>nebulosa</i>		c. Widespread	ii. Arid area specialist
Thysanura	Lepismatidae	<i>Ctenolepisma</i>	<i>intercura</i>		c. Widespread	iv. Generalist
Thysanura	Lepismatidae	<i>Ctenolepisma</i>	<i>terebrans</i>		c. Widespread	iv. Generalist
Blattodea	Blatellidae	<i>Namablatta</i>	<i>bitaeniata</i>		c. Widespread	ii. Arid area specialist
Blattodea	Euthyrrhaphidae	<i>Tivia</i>	<i>simulatrix</i>		c. Widespread	ii. Arid area specialist
Isoptera	Rhinotermitidae	<i>Psammotermes</i>	<i>allocerus</i>		a. Sand Sea	i. Dune Sea specialist
Isoptera	Hodotermitidae	<i>Hodotermes</i>	<i>mossambicus</i>		c. Widespread	iv. Generalist
Mantodea	Empusidae	<i>Empusa</i>	<i>guttula</i>		c. Widespread	iv. Generalist
Orthoptera	Acrididae	<i>Acocksacris</i>	<i>carpi</i>		c. Widespread	ii. Arid area specialist
Orthoptera	Acrididae	<i>Acocksacris</i>	<i>namibensis</i>		c. Widespread	ii. Arid area specialist
Orthoptera	Acrididae	<i>Brainia</i>	<i>hirsuta</i>		a. Sand Sea	ii. Arid area specialist
Orthoptera	Acrididae	<i>Acrotylus</i>	<i>gracilis</i>		c. Widespread	iv. Generalist
Orthoptera	Acrididae	<i>Acrotylus</i>	<i>patruelis</i>		c. Widespread	iv. Generalist
Orthoptera	Acrididae	<i>Brachyphymus</i>	<i>vylderi</i>		c. Widespread	ii. Arid area specialist
Orthoptera	Acrididae	<i>Lithidium</i>	<i>desertorum</i>		c. Widespread	ii. Arid area specialist
Orthoptera	Acrididae	<i>Schistocerca</i>	<i>gregaria flaviventris</i>		c. Widespread	ii. Arid area specialist
Orthoptera	Acrididae	<i>Sphingonotus</i>	<i>scabriculus</i>		c. Widespread	ii. Arid area specialist
Orthoptera	Bradyporidae	<i>Acanthoproctus</i>	<i>diadematus</i>		a. Sand Sea	i. Dune Sea specialist
Orthoptera	Schizodactylidae	<i>Comicus</i>	<i>carnalli</i>		a. Sand Sea	i. Dune Sea specialist
Orthoptera	Schizodactylidae	<i>Comicus</i>	<i>calcaris</i>		a. Sand Sea	i. Dune Sea specialist
Orthoptera	Schizodactylidae	<i>Comicus</i>	<i>arenarius</i>		a. Sand Sea	i. Dune Sea specialist
Orthoptera	Stenopelmatidae	<i>Maxentius</i>	<i>kuhlgatzi</i>		a. Sand Sea	i. Dune Sea specialist

Order	Family	Genus	Species	Common Name	NSS Biogeography	NSS Ecological range
Orthoptera	Stenopelmatidae	<i>Maxentius</i>	<i>pinguis</i>		a. Sand Sea	i. Dune Sea specialist
Heteroptera	Cydnidae	<i>Cydnus</i>	<i>hirsutus</i>		a. Sand Sea	iii. Habitat specialist
Heteroptera	Lygaeidae	<i>Dieuches</i>	<i>herero</i>		c. Widespread	iv. Generalist
Heteroptera	Lygaeidae	<i>Geocoris</i>	<i>scutellaris</i>		c. Widespread	iv. Generalist
Heteroptera	Lygaeidae	<i>Geocoris</i>	<i>sjostedti</i>		c. Widespread	iv. Generalist
Heteroptera	Pentatomidae	<i>Antestia</i>	<i>variegata</i>		c. Widespread	iv. Generalist
Homoptera	Diaspididae	<i>Namibia</i>	<i>spinosa</i>		a. Sand Sea	iii. Habitat specialist
Homoptera	Psyllidae	<i>Colposcena</i>	<i>australis</i>		a. Sand Sea	iii. Habitat specialist
Homoptera	Psyllidae	<i>Colposcena</i>	<i>namibiensis</i>		a. Sand Sea	iii. Habitat specialist
Homoptera	Cicadellidae	<i>Aconurella</i>	<i>minutissima</i>		c. Widespread	iv. Generalist
Homoptera	Cicadellidae	<i>Circulifer</i>	<i>tenellus</i>		c. Widespread	iv. Generalist
Neuroptera	Myrmeleontidae	<i>Pamares</i>	<i>deru</i>		a. Sand Sea	i. Dune Sea specialist
Neuroptera	Myrmeleontidae	<i>Golafrus</i>	<i>oneili</i>		c. Widespread	ii. Arid area specialist
Neuroptera	Myrmeleontidae	<i>Pamares</i>	<i>damarus</i>		c. Widespread	ii. Arid area specialist
Neuroptera	Chrysopidae	<i>Italochrysa</i>	<i>turneri</i>		c. Widespread	iii. Habitat specialist
Coleoptera	Anthicidae	<i>Anthicus</i>	<i>crinitus</i>		c. Widespread	iv. Generalist
Coleoptera	Anthicidae	<i>Anthicus</i>	<i>techowi</i>		c. Widespread	iv. Generalist
Coleoptera	Apionidae	<i>Corimalia</i>	<i>damarensis</i>		c. Widespread	iv. Generalist
Coleoptera	Buprestidae	<i>Acmaeodera</i>	<i>liessnerae</i>		b. Inselbergs	iv. Generalist
Coleoptera	Buprestidae	<i>Acmaeodera</i>	<i>louwi</i>		b. Inselbergs	iv. Generalist
Coleoptera	Buprestidae	<i>Julodis</i>	<i>mitifica</i>		a. Sand Sea	iii. Habitat specialist
Coleoptera	Buprestidae	<i>Nothomorhoides</i>	<i>irishi</i>		b. Inselbergs	iv. Generalist
Coleoptera	Carabidae	<i>Crepidogaster</i>	<i>kochi</i>		c. Widespread	iv. Generalist
Coleoptera	Chrysomelidae	<i>Monolepta</i>	<i>desertorum</i>		c. Widespread	iii. Habitat specialist
Coleoptera	Cleridae	<i>Necrobia</i>	<i>rufipes</i>		c. Widespread	iii. Habitat specialist
Coleoptera	Coccinellidae	<i>Cheilomenes</i>	<i>lunata</i>		c. Widespread	iv. Generalist
Coleoptera	Coccinellidae	<i>Exochomus</i>	<i>flaviventris</i>		c. Widespread	iv. Generalist
Coleoptera	Coccinellidae	<i>Pharoscymnus</i>	<i>kuseibensis</i>		c. Widespread	iii. Habitat specialist
Coleoptera	Curculionidae	<i>Hyomora</i>	<i>falcipes</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Curculionidae	<i>Hyomora</i>	<i>subvirens</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Curculionidae	<i>Hyomora</i>	<i>manca</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Curculionidae	<i>Leptostethus</i>	<i>aureus</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Curculionidae	<i>Leptostethus</i>	<i>fallax</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Curculionidae	<i>Leptostethus</i>	<i>speciosus</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Curculionidae	<i>Leptostethus</i>	<i>sublineatus</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Curculionidae	<i>Leptostethus</i>	<i>uniformis</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Curculionidae	<i>Leptostethus</i>	<i>varius</i>		a. Sand Sea	i. Dune Sea specialist

Order	Family	Genus	Species	Common Name	NSS Biogeography	NSS Ecological range
Coleoptera	Curculionidae	<i>Leptostethus</i>	<i>waltoni</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Geotrupidae	<i>Namibiotrupes</i>	<i>penrithae</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Geotrupidae	<i>Prototrupes</i>	<i>kochi</i>		c. Widespread	ii. Arid area specialist
Coleoptera	Glaresidae	<i>Glaresis</i>	<i>namibensis</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Glaresidae	<i>Glaresis</i>	<i>koenigsbaueri</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Glaresidae	<i>Glaresis</i>	<i>holmi</i>		c. Widespread	iii. Habitat specialist
Coleoptera	Histeridae	<i>Hister</i>	<i>namas</i>		c. Widespread	ii. Arid area specialist
Coleoptera	Histeridae	<i>Pholioxenus</i>	<i>endroedyi</i>		c. Widespread	ii. Arid area specialist
Coleoptera	Histeridae	<i>Saprinus</i>	<i>cupreus</i>		c. Widespread	iv. Generalist
Coleoptera	Histeridae	<i>Tribalus</i>	<i>namibiensis</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Histeridae	<i>Tribalus</i>	<i>kochi</i>		c. Widespread	ii. Arid area specialist
Coleoptera	Malachiidae	<i>Attalus</i>	<i>kochi</i>		c. Widespread	ii. Arid area specialist
Coleoptera	Malachiidae	<i>Dinometopus</i>	<i>narebisanus</i>		c. Widespread	ii. Arid area specialist
Coleoptera	Malachiidae	<i>Metaphilhedonus</i>	<i>penrithae</i>		c. Widespread	ii. Arid area specialist
Coleoptera	Meloidae	<i>Actenodia</i>	<i>mirabilis</i>		c. Widespread	ii. Arid area specialist
Coleoptera	Meloidae	<i>Australytta</i>	<i>szekessyi</i>		c. Widespread	ii. Arid area specialist
Coleoptera	Meloidae	<i>Ceroctis</i>	<i>phalerata</i>		c. Widespread	iv. Generalist
Coleoptera	Meloidae	<i>Hycleus</i>	<i>brincki</i>		c. Widespread	ii. Arid area specialist
Coleoptera	Meloidae	<i>Hycleus</i>	<i>deserticolus</i>		c. Widespread	ii. Arid area specialist
Coleoptera	Meloidae	<i>Hycleus</i>	<i>svakopinus</i>		c. Widespread	ii. Arid area specialist
Coleoptera	Meloidae	<i>Hycleus</i>	<i>tinctus</i>		c. Widespread	ii. Arid area specialist
Coleoptera	Meloidae	<i>Hycleus</i>	<i>zigzagus</i>		c. Widespread	iv. Generalist
Coleoptera	Meloidae	<i>Iselma</i>	<i>deserticola</i>		b. Inselbergs	ii. Arid area specialist
Coleoptera	Meloidae	<i>Lydomorphus</i>	<i>karibibensis</i>		c. Widespread	ii. Arid area specialist
Coleoptera	Meloidae	<i>Lydomorphus</i>	<i>thoracicus</i>		c. Widespread	iv. Generalist
Coleoptera	Meloidae	<i>Paractenodia</i>	<i>freyi</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Meloidae	<i>Prolytta</i>	<i>namibensis</i>		c. Widespread	ii. Arid area specialist
Coleoptera	Melyridae	<i>Attalus</i>	<i>oberprieleri</i>		c. Widespread	ii. Arid area specialist
Coleoptera	Melyridae	<i>Dinometopus</i>	<i>narebisanus</i>		c. Widespread	ii. Arid area specialist
Coleoptera	Melyridae	<i>Metaphilhedonus</i>	<i>swakopmundensis</i>		c. Widespread	ii. Arid area specialist
Coleoptera	Melyridae	<i>Penhedybius</i>	<i>namibicus</i>		c. Widespread	ii. Arid area specialist
Coleoptera	Melyridae	<i>Urodactylus</i>	<i>kuissepensis</i>		c. Widespread	ii. Arid area specialist
Coleoptera	Mordellidae	<i>Mordella</i>	<i>turneri</i>		c. Widespread	iv. Generalist
Coleoptera	Nitidulidae	<i>Carpophilus</i>	<i>dimidiatus</i>		c. Widespread	iv. Generalist
Coleoptera	Ochodaeidae	<i>Namibiotalpa</i>	<i>fossilis</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Ochodaeidae	<i>Synochodaeus</i>	<i>cucullus</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Ochodaeidae	<i>Synochodaeus</i>	<i>costatus</i>		c. Widespread	ii. Arid area specialist

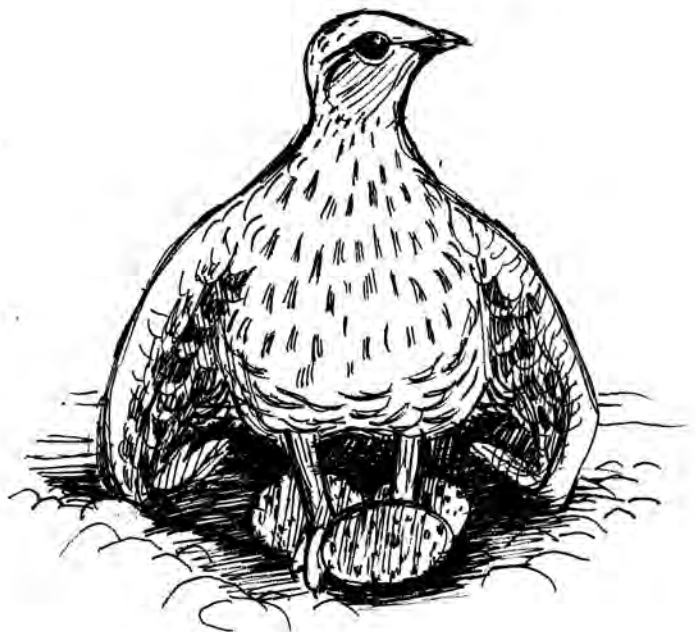
Order	Family	Genus	Species	Common Name	NSS Biogeography	NSS Ecological range
Coleoptera	Phalacridae	<i>Olibrus</i>	<i>evanescens</i>		c. Widespread	iv. Generalist
Coleoptera	Ptinidae	<i>Damarus</i>	<i>magnus</i>		a. Sand Sea	iv. Generalist
Coleoptera	Ptinidae	<i>Stethomezium</i>	<i>notiale</i>		a. Sand Sea	iv. Generalist
Coleoptera	Scarabaeidae	<i>Aphodius</i>	<i>ganabi</i>		c. Widespread	ii. Arid area specialist
Coleoptera	Scarabaeidae	<i>Aphodius</i>	<i>gobabensis</i>		c. Widespread	ii. Arid area specialist
Coleoptera	Scarabaeidae	<i>Aphodius</i>	<i>psammophilus</i>		c. Widespread	ii. Arid area specialist
Coleoptera	Scarabaeidae	<i>Aphodius</i>	<i>wardi</i>		c. Widespread	ii. Arid area specialist
Coleoptera	Scarabaeidae	<i>Hammondantus</i>	<i>psammophilus</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Scarabaeidae	<i>Namakwanus</i>	<i>irishi</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Scarabaeidae	<i>Psammmodaphodius</i>	<i>kochi</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Scarabaeidae	<i>Scarabaeus</i>	<i>denticollis</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Scarabaeidae	<i>Scarabaeus</i>	<i>fitzimonsi</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Scarabaeidae	<i>Scarabaeus</i>	<i>rodriguesi</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Scarabaeidae	<i>Scarabaeus</i>	<i>rotundigena</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Scarabaeidae	<i>Scarabaeus</i>	<i>bennigseni</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Scarabaeidae	<i>Scarabaeus</i>	<i>rubripennis</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Scarabaeidae	<i>Scarabaeus</i>	<i>vansonii</i>		a. Sand Sea	ii. Arid area specialist
Coleoptera	Scarabaeidae	<i>Sparrmannia</i>	<i>boschimana</i>		a. Sand Sea	ii. Arid area specialist
Coleoptera	Scarabaeidae	<i>Sparrmannia</i>	<i>similis</i>		a. Sand Sea	ii. Arid area specialist
Coleoptera	Staphylinidae	<i>Bledius</i>	<i>brincki</i>		c. Widespread	iv. Generalist
Coleoptera	Staphylinidae	<i>Philonthus</i>	<i>nigrinus</i>		c. Widespread	iv. Generalist
Coleoptera	Tenebrionidae	<i>Archinamibia</i>	<i>peezi</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Argentocrinis</i>	<i>lossowi</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Arthrochora</i>	<i>arenicola</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Brinckia</i>	<i>debilis</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Brinckia</i>	<i>insularis</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Brinckia</i>	<i>vaga</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Caenocrypticus</i>	<i>delabati</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Caenocrypticus</i>	<i>kochi</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Caenocrypticus</i>	<i>noctivagus</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Caenocrypticus</i>	<i>pauliani</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Caenocrypticus</i>	<i>peezi</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Caenocrypticus</i>	<i>penrithae</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Caenocrypticus</i>	<i>ephialtes</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Caenocrypticus</i>	<i>phaleroides</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Calognathus</i>	<i>chevrolati</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Cauricara</i>	<i>brunnipes</i>		a. Sand Sea	i. Dune Sea specialist

Order	Family	Genus	Species	Common Name	NSS Biogeography	NSS Ecological range
Coleoptera	Tenebrionidae	<i>Fossilochile</i>	<i>rufa</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Lepidochora</i>	<i>sp. nov. (undescribed)</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Lepidochora</i>	<i>discoidalis</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Lepidochora</i>	<i>kahani</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Lepidochora</i>	<i>porti</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Leubbertia</i>	<i>plana</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Namibomodes</i>	<i>maculicollis</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Namibomodes</i>	<i>zarcoi</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Onymacris</i>	<i>laeviceps</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Onymacris</i>	<i>rugatipennis</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Onymacris</i>	<i>unguicularis</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Onymacris</i>	<i>boschimana</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Onymacris</i>	<i>plana</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Oppenheimeria</i>	<i>bombophthalma</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Oxura</i>	<i>rufotibiata planipennata</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Pachynotelus</i>	<i>albonotatus</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Pachynotelus</i>	<i>kuehnelti</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Psammogaster</i>	<i>malani</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Pterostichula</i>	<i>aridipaludis</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Pterostichula</i>	<i>fontanalisis</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Stenocara</i>	<i>fitzsimonsi</i>		b. Inselbergs	ii. Arid area specialist
Coleoptera	Tenebrionidae	<i>Sulcipectus</i>	<i>levis</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Trachynotidus</i>	<i>rufozonatus</i>		c. Widespread	ii. Arid area specialist
Coleoptera	Tenebrionidae	<i>Uniungulum</i>	<i>hoeschi</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Vansonium</i>	<i>bushmanicum namibense</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>caecus</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>damarensis</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>eremita</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>fairmairei fairmairei</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>fairmairei luederitzensis</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>hamiltonuli</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>hereroensis</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>moralesi</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>sexfrenorum</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>gracilipes</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>orbicularis</i>		a. Sand Sea	i. Dune Sea specialist
Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>prona</i>		a. Sand Sea	i. Dune Sea specialist

Order	Family	Genus	Species	Common Name	NSS Biogeography	NSS Ecological range
Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>testudinaria</i>		a. Sand Sea	ii. Arid area specialist
Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>cariniceps</i>		c. Widespread	ii. Arid area specialist
Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>fortunata</i>		c. Widespread	ii. Arid area specialist
Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>giessi</i>		c. Widespread	ii. Arid area specialist
Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>hypallaga</i>		c. Widespread	ii. Arid area specialist
Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>meridionalis</i>		c. Widespread	ii. Arid area specialist
Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>mniszечи</i>		c. Widespread	ii. Arid area specialist
Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>omnigena</i>		c. Widespread	ii. Arid area specialist
Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>parentalis</i>		c. Widespread	ii. Arid area specialist
Coleoptera	Tenebrionidae	<i>Zophosis</i>	<i>prevastitatis</i>		c. Widespread	ii. Arid area specialist
Diptera	Asilidae	<i>Laphystia</i>	<i>kochi</i>		c. Widespread	ii. Arid area specialist
Diptera	Calliphoridae	<i>Isomyia</i>	<i>deserti</i>		c. Widespread	ii. Arid area specialist
Lepidoptera	Noctuidae	<i>Cylogramma</i>	<i>latona</i>		c. Widespread	iv. Generalist
Lepidoptera	Noctuidae	<i>Grammodes</i>	<i>stolida</i>		c. Widespread	iv. Generalist
Lepidoptera	Sphingidae	<i>Celerio</i>	<i>lineata livornica</i>		c. Widespread	iv. Generalist
Hymenoptera	Formicidae	<i>Camponotus</i>	<i>detritus</i>		a. Sand Sea	i. Dune Sea specialist
Hymenoptera	Formicidae	<i>Camponotus</i>	<i>maculatus</i>		c. Widespread	iv. Generalist
Hymenoptera	Formicidae	<i>Camponotus</i>	<i>mystaceus</i>		c. Widespread	iv. Generalist
Hymenoptera	Mutillidae	<i>Strangulotilla</i>	<i>namibiana</i>		c. Widespread	iv. Generalist
Hymenoptera	Bradynobaenidae	<i>Apterogyna</i>	<i>schultzei</i>		a. Sand Sea	i. Dune Sea specialist
Hymenoptera	Colletidae	<i>Colletes</i>	<i>schultzei</i>		a. Sand Sea	i. Dune Sea specialist
Hymenoptera	Sphecidae	<i>Gastrosericus</i>	<i>mirabilis</i>		a. Sand Sea	i. Dune Sea specialist
Hymenoptera	Sphecidae	<i>Miscophus</i>	<i>deserticolus</i>		a. Sand Sea	i. Dune Sea specialist

Annex 19

Protective Designation



No. 118

1 August 1979

WITHDRAWAL OF DECLARATION OF GAME PARKS: NAMIB DESERT PARK AND NAUKLUFT MOUNTAIN ZEBRA PARK; AND DECLARATION OF GAME PARK: NAMIB-NAUKLUFT PARK

The Executive Committee has —

(a) under and by virtue of the provisions of section 16 of the Nature Conservation Ordinance, 1975 (Ordinance 4 of 1975) withdrawn the declaration of game parks of the areas known as the Namib Desert Park and the Naukluft Mountain Zebra Park and described in paragraphs 7 and 8 of the Schedule to Proclamation 19 of 1968, amended the said Proclamation accordingly by deleting paragraphs 7 and 8; and

(b) under and by virtue of the provisions of section 14 of the Nature Conservation Ordinance, 1975 (Ordinance 4 of 1975) declared the area described in the Schedule hereto as a game park.

SCHEDULE

NAMIB-NAUKLUFT PARK

The area defined as follows:—

Beginning at the point where the eastern boundary of the Territory of Walvis Bay intersects the left bank of

No. 118

1 Augustus 1979

INTREKKING VAN VERKLARING TOT WILDTUINE: NAMIB-WOESTYNPARK EN BERGSEBRAPARK NAUKLUFT: EN VERKLARING TOT WILDTUIN: NAMIB-NAUKLUFT-PARK

Die Uitvoerende Komitee het —

(a) kragtens en ingevolge die bepalings van artikel 16 van die Ordonnansie op Natuurbewaring, 1975 (Ordonnansie 4 van 1975) die verklaring tot wildtuine van die gebiede wat bekend staan as die Namibwoestynpark en die Bergsebrapark Naukluft en omskryf word in paragrawe 7 en 8 van die Bylae by Proklamasie 19 van 1968, ingetrek, en genoemde proklamasie dienooreenkomstig gewysig deur genoemde paragrawe 7 en 8 te skrap; en

(b) kragtens en ingevolge die bepalings van artikel 14 van die Ordonnansie op Natuurbewaring, 1975 (Ordonnansie 4 van 1975) die gebied in die Bylae hierby omskryf tot wildtuin verklaar.

BYLAE

NAMIB-NAUKLUFT-PARK

Die gebied soos volg omgrens:—

Begin by die punt waar die oostelike grens van die Gebied Walvisbaai die linkerouer van die Swakop-

the Swakop River; thence eastwards along the left bank of the Swakop River to the confluence of the Swakop and Khan Rivers; thence north-eastwards along the left bank of the Khan River to a point due north-west of the southernmost corner beacon of the farm Marmor Pforte 37; thence in a straight line to the southernmost corner beacon of Marmor Pforte 37; thence north-eastwards along the boundaries of the following properties so as to exclude them from this area, viz. Marmor Pforte 37, Farm No. 116, Modderfontein 131, Jakkalswater 13, Vredelus 112, Portion 1 of Vredelus 112 and Horebis Nord 61 to the point where the southern boundary of Horebis Nord 61 intersects the right bank of the Swakop River; thence in a straight line across the Swakop River to the point where the southern boundary of Horebis Süd 103 intersects the left bank of the Swakop River; thence south-eastwards along the boundaries of the following properties so as to exclude them from this area, viz. Horebis Süd 108, Rooikuseb 109, Wilsonfontein 110, Portion 1 (Donkerhuk West) of Donkerhuk 91, Onanis 121, Portion 1 (Harmonie) of Onanis 121, Onanis 121, Portion 3 (Haukubib) of Emeritus 123, Portion 2 (Hoogland) of Ruimte 125, Portion 1 (Rembrand-Pan) of Ruimte 125, Ruimte 125, Kraaipoot 124 and Schlesien 126, to the point where the south-western boundary of Schlesien 126 intersects the right bank of the Kuiseb River; thence in a straight line across the Kuiseb River to the point where the western boundary of Schlesien 483 intersects the left bank of the Kuiseb River; thence southwards along the boundaries of the following properties so as to exclude them from this area, viz. Schlesien 483, Portion 1 of Rostock 393, Portion 1 (Oase) of Greylingshof 107, Greylingshof 107, Rostock South 414, Portion 1 (Chasé) of Kromhoek 416, Portion 1 (Tinkie) of Farm No. 399, Samara 400, Reingeluk 791, Portion 1 (Vito) of Farm No. 401, Morewag 524, Toevlug 117, Kasupi 135, Escourt 402, Dieprivier 403, Weltevrede 404, Portion 1 (Dieprivier Oos) of Dieprivier 403, Abendruhe 411, Abbabis 3, Portion 1 of Consolidated Remhoogte 227, Consolidated Remhoogte 227, Blässkranz 7, Büllsport 172, Berghoek 506, Neu Onis 10, Onis 8, Portion 1 (Neuras Nord) of Neuras 6, Urikos 4, Urikos West 123, Portion 1 (Purperwinde) of Goede Hoop 135, Portion 2 of Goede Hoop 135, Goede Hoop 135, Oorwinning 134, Sesriem 137, Eensaam 157, Farm No. 103, Farm No. 101, Geluk 138 and Vreemdelingspoort 141 to southernmost corner beacon of Vreemdelingspoort 141; thence westwards to the point where the lines drawn due west from the southernmost corner beacon of Vreemdelingspoort 141 and due south from the waterhole Natab, north of the Kuiseb Rivier, intersect; thence due north to the left bank of the Kuiseb River; thence westwards in a straight line to a point on the coastline of the Atlantic Ocean approximately 22 kilometres south of the waterhole Anichab at Sandwich Harbour where the southern end of the Salt Pan and the northern end of the "Black Wall" or "Lange Wand", being a ridge of sand dunes running along the coast, meet; thence further westwards along the mentioned straight

rivier kruis; daarvandaan ooswaarts langs die linker oewer van die Swakoprivier tot by die samevloeiing van die Swakop- en Khanrivier; daarvandaan noordooswaarts langs die linkeroewer van die Khanrivier tot by 'n punt reg noordwes vanaf die suidelikste hoekbaken van die plaas Marmor Pforte 37; daarvandaan in 'n reguit lyn tot by die suidelikste hoekbaken van Marmor Pforte 37; daarvandaan noordooswaarts langs die grense van die volgende eiendomme om hulle uit hierdie gebied uit te sluit naamlik Marmor Pforte 37, Plaas Nr. 116, Modderfontein 131, Jakkalswater 13, Vredelus 112, Gedeelte 1 van Vredelus 112 en Horebis Nord 61 tot by die punt waar die suidelike grens van Horebis Nord 61 die regteroewer van die Swakoprivier kruis; daarvandaan in 'n reguit lyn oor die Swakoprivier tot by die punt waar die suidelike grens van Horebis Süd 108 die linkeroewer van die Swakoprivier kruis; daarvandaan suidooswaarts langs die grense van die volgende eiendomme om hulle uit hierdie gebied uit te sluit, naamlik Horebis Süd 108, Rooikuseb 109, Wilsonfontein 110, Gedeelte 1 (Donkerhuk West) van Donkerhuk 91, Onanis 121, Gedeelte 1 (Harmonie) van Onanis 121, Onanis 121, Gedeelte 3 (Haukubib) van Emeritus 123, Gedeelte 2 (Hoogland) van Ruimte 125, Gedeelte 1 (Rembrand-Pan) van Ruimte 125, Ruimte 125, Kraaipoot 124 en Schlesien 126 tot by die punt waar die suidwestelike grens van Schlesien 126 die regteroewer van die Kuisebrivier kruis; daarvandaan in 'n reguit lyn oor die Kuisebrivier tot by die punt waar die westelike grens van Schlesien 483 die linkeroewer van die Kuisebrivier kruis; daarvandaan suidwaarts langs die grense van die volgende eiendomme om hulle uit hierdie gebied uit te sluit, naamlik Schlesien 483, Gedeelte 1 van Rostock 393, Gedeelte 1 (Oase) van Greylingshof 107, Greylingshof 107, Rostock South 414, Gedeelte 1 (Chasé) van Kromhoek 416, Gedeelte 1 (Tinkie) van Plaas Nr. 399, Samara 400, Reingeluk 791, Gedeelte 1 (Vito) van Plaas Nr. 401, Morewag 524, Toevlug 117, Kasupi 135, Escourt 402, Dieprivier 403, Weltevrede 404, Gedeelte 1 (Dieprivier Oos) van Dieprivier 403, Abendruhe 411, Abbabis 3, Gedeelte 1 van Gekonsolideerde Remhoogte 227, Gekonsolideerde Remhoogte 227, Blässkranz 7, Büllsport 172, Berghoek 506, Neu Onis 10, Onis 8, Gedeelte 1 (Neuras Nord) van Neuras 6, Urikos 4, Urikos West 123, Gedeelte 1 (Purperwinde) van Goede Hoop 135, Gedeelte 2 van Goede Hoop 135, Goede Hoop 135, Oorwinning 134, Sesriem 137, Eensaam 157, Plaas Nr. 103, Plaas Nr. 101, Geluk 138 en Vreemdelingspoort 141 tot by die suidelikste hoekbaken van Vreemdelingspoort 141; daarvandaan weswaarts tot by die punt waar die lyne getrek reg wes vanaf die suidelikste hoekbaken van Vreemdelingspoort 141 en reg suid vanaf die watergat Natab, noord van die Kuisebrivier, mekaar kruis; daarvandaan reg noord tot by die linkeroewer van die Kuisebrivier; daarvandaan weswaarts in 'n reguit lyn tot by 'n punt aan die kuslyn van die Atlantiese Oseaan ongeveer 22 kilometer suid van die watergat Anichab by Sandwich Harbour waar die suidelike punt van die Soutpan en die noordelike punt van die "Black Wall" of "Lange Wand", 'n rif sandduine wat langs die kus loop.

line to a point in the sea 1,609 kilometres measured from the low-water mark of the Atlantic Ocean; thence northwards along a line 1,609 kilometres from and parallel to the low-water mark of the Atlantic Ocean to the point where it intersects the extension of the southern boundary of the Territory of Walvis Bay; thence eastwards along the mentioned extension and the boundaries of the Territory of Walvis Bay so as to exclude it from this area to the point where the eastern boundary of the Territory of Walvis Bay intersects the left bank of the Swakop River, the point of beginning, but excluding the following properties viz. Three Sisters 96, Nadine 101, Weitzenberg 26 and all its portions, Goanikontes 28 and all its portions, Haigamkab 29 and all its portions, Hildenhof 58, Arcadia 80, Sunnyside 81, Nabas 141, Riet 30, Dieptal 25 and all its portions, Gaub 101 and Salem 102.

bymekaarkom; daarvandaan verder weswaarts die see in met genoemde reguit lyn tot by 'n punt 1,609 kilometer vanaf die laagwatermerk van die Atlantiese Oseaan; daarvandaan noordwaarts met 'n lyn 1,609 kilometer van en parallel met die laagwatermerk van die Atlantiese Oseaan tot by die punt waar dit die verlenging van die suidelike grens van die Gebied Walvisbaai ontmoet; daarvandaan ooswaarts langs genoemde verlenging en die grense van die Gebied Walvisbaai om dit uit hierdie gebied uit te sluit tot by die punt waar die oostelike grens van die Gebied Walvisbaai die linkeroewer van die Swakoprivier kruis, die beginpunt, maar uitsluitende die volgende eiendomme, naamlik Three Sisters 96, Nadine 101, Weitzenberg 26 en al sy gedeeltes, Goanikontes 28 en al sy gedeeltes, Haigamkab 29 en al sy gedeeltes, Hildenhof 58, Arcadia 80, Sunnyside 81, Nabas 141, Riet 30, Dieptal 25 en al sy gedeeltes, Gaub 101 en Salem 102.

No. 119

1 August 1979

NOTIFICATION OF A REQUEST THAT
DISTRICT ROAD 204 BE DEVIATED: DISTRICT
OF KARASBURG

No. 119

1 Augustus 1979

BEKENDMAKING VAN 'N VERSOEK DAT
DISTRİKSPAD 204 VERLË WORD: DISTRİK
KARASBURG

Goewermentskennisgewings

Government Notices

DEPARTEMENT VAN LANDBOU EN
NATUURBEWARINGDEPARTMENT OF AGRICULTURE AND
NATURE CONSERVATION

No. 180

1986

No. 180

1986

WYSIGING VAN DIE GRENSE VAN DIE
NAMIB-NAUKLUFT-PARKAMENDMENT OF THE BOUNDARIES
OF THE NAMIB-NAUKLUFT-PARK

Ingevolge artikel 15 van die Ordonnansie op Natuurbewaring, 1975 (Ordonnansie 4 van 1975), word hierby bekend gemaak dat die Kabinet die grense van die Namib-Naukluft-Park, wat tot wildduin verklaar is by Goewermentskennisgewing 118 van 1979, gewysig het deur die gebied in die Bylae omskryf daarby in te sluit.

In terms of section 15 of the Nature Conservation Ordinance, 1975 (Ordinance 4 of 1975), it is hereby made known that the Cabinet has amended the boundaries of the Namib-Naukluft-Park, which was declared to be a game park by Government Notice 118 of 1979, by including the area described in the Schedule.

BYLAE

SCHEDULE

Die gebied soos volg omgrens:

The area defined as follows:

Begin by die punt op die hoogwatermerk aan die kuslyn van die Atlantiese Oseaan ongeveer 22 km suid van die watergat Anichab by Sandwich Harbour, waar die denkbeeldige lyn getrek reg wes vanaf die punt waar die suidelike punt van die Soutpan en die noordelike punt van die "Black Wall" of "Lange Wand", 'n rif sandduine wat langs die kus loop, bymekaarkom, die hoogwatermerk kruis; daarvandaan langs die denkbeeldige lyn getrek deur die bedoelde punt waar die suidelike punt van die Soutpan en die noordelike punt van die genoemde "Black Wall" of "Lange Wand", bymekaarkom, ooswaarts tot by die punt op die suidelike oewer van die Kuisebrivier waar sodanige denkbeeldige lyn en die denkbeeldige lyn getrek reg suid vanaf die watergat Natab, noord van die Kuisebrivier, kruis; daarvandaan langs laasgenoemde denkbeeldige lyn suidwaarts tot by die punt waar sodanige lyn die denkbeeldige lyn getrek reg wes vanaf die suidelikste hoekbaken van die plaas Vreemdelingspoort 141 kruis; daarvandaan langs laasgenoemde denkbeeldige lyn ooswaarts tot by die suidelikste hoekbaken van die plaas Vreemdelingspoort 141; daarvandaan suidwaarts langs die grense van die volgende eiendomme om hulle uit hierdie gebied uit te sluit, naamlik Kwessiegat 173, Jagkop 156, Wol-

Beginning at the point on the high-water mark on the coastline of the Atlantic Ocean, approximately 22 kilometres south of the waterhole Anichab at Sandwich Harbour, where the imaginary line drawn due west from the point where the southern end of the Salt Pan and the northern end of the "Black Wall" or "Lange Wand", being a ridge of sand dunes running along the coast, meet, intersects the highwater mark; thence along the imaginary line drawn through the point referred to where the southern end of the Salt Pan and the northern end of the said "Black Wall" or "Lange Wand" meet, eastwards to the point on the southern bank of the Kuiseb River where such imaginary line and the imaginary line drawn due south from the waterhole Natab, north of the Kuiseb River, intersect; thence along the last-mentioned imaginary line southwards to the point where such line intersects the imaginary line drawn due west from the southernmost corner beacon of the farm Vreemdelingspoort 141; thence along the last-mentioned imaginary line eastwards to the southernmost corner beacon of the farm Vreemdelingspoort 141; thence southwards along the boundaries of the following properties so as to exclude them from this area, viz Kwessiegat 173, Jagkop 156, Wolwedans 144,

wedans 144, Gorrasis 99, Springbokvlakte 166, Kumbis 55, Kanaän 104, Kamaland 129, Plaas No. 97, Plaas No. 123, Numis 89, Gunsbewys 139, Plaas No. 108, Alabama 140, Plaas No. 137, Plaas No. 136, Eureka 49, Plaas No. 112 en Ausweiche 46 tot by die punt waar die noordelike grens van die padreserwe van hoofpad 4, seksie 2, tussen Aus en Lüderitz, die noordwestelike grens van laasgenoemde plaas kruis; daarvandaan weswaarts langs die noordelike grens van die genoemde padreserwe tot by die punt waar daardie padreserwegrens die denkbeeldige lyn getrek reg suid vanaf die trigonometriese baken Klammerberg 12 op die Kowisberge, kruis; daarvandaan noordwaarts langs laasgenoemde lyn deur die genoemde baken Klammerberg 12 tot by die punt waar genoemde lyn die ses-en-twintigste breedtegraad kruis; daarvandaan langs genoemde breedtegraad die hoogwatermerk van die Atlantiese Oseaan kruis; daarvandaan algemeen noordwaarts langs genoemde hoogwatermerk tot by die punt op die hoogwatermerk aan die kuslyn van die Atlantiese Oseaan ongeveer 22 kilometer suid van die watergat Anichab by Sandwich Harbour waar die denkbeeldige lyn getrek reg wes vanaf die punt waar die suidelike punt van die Soutpan en die noordelike punt van die "Black Wall" of "Lange Wand", bymekaarkom, die hoogwatermerk kruis, die beginpunt.

Gorrasis 99, Springbokvlakte 166, Kumbis 55, Kanaän 104, Kamaland 129, Farm No. 97, Farm No. 123, Numis 89, Gunsbewys 139, Farm No. 108, Alabama 140, Farm No. 137, Farm No. 136, Eureka 49, Farm No. 112 and Ausweiche 46, to the point where the northern boundary of the road reserve of trunk road 4, section 2, between Aus and Lüderitz, intersects the north-western boundary of the last-mentioned farm; thence westwards along the northern boundary of the said road reserve to the point where the boundary of that road reserve intersects the imaginary line drawn due south from the trigonometrical beacon Klammerberg 12 on the Kowis mountains; thence northwards along the last-mentioned line through the beacon Klammerberg 12 to the point where the said line intersects the twenty-sixth degree of latitude; thence along the said degree of latitude westwards to the point where the said degree of latitude intersects the high-water mark of the Atlantic Ocean; thence generally northwards along the said high-water mark to the point on the high-water mark on the coastline of the Atlantic Ocean, approximately 22 kilometres south of the waterhole Anichab at Sandwich Harbour, where the imaginary line drawn due west from the point where the southern end of the Salt Pan and the northern end of the "Black Wall" or "Lange Wand", meet, intersects the high-water mark, the point of beginning.

 DEPARTEMENT VAN EKONOMIESE SAKE

No. 181

1986

 HANDELSWAREMERKE-WET, 1941
 (WET 17 VAN 1941): VOORGENOME
 VERBOD OP DIE GEBRUIK VAN
 'N SEKERE EMBLEEM

Ingevolge artikel 13 van die Handelwaremerke-wet, 1941 (Wet 17 van 1941), maak die Kabinet hierby bekend dat hy deur die eienaar van Eagle Motors (Hentiesbaai) versoek is om kragtens artikel 15(1) van genoemde Wet die gebruik, deur enigiemand anders as genoemde eienaar, van onderstaande embleem, in verband met die motorhandel, -besigheid, -beroep of -bedryf, te verbied:

 DEPARTMENT OF ECONOMIC AFFAIRS

No. 181

1986

 MERCHANDISE MARKS ACT, 1941
 (ACT 17 OF 1941): PROPOSED
 PROHIBITION OF THE USE OF A
 CERTAIN EMBLEM

In terms of section 13 of the Merchandise Marks Act, 1941 (Act 17 of 1941), the Cabinet hereby gives notice that it has been requested by the owner of Eagle Motors (Henties Bay) to prohibit, under section 15(1) of the said Act, the use of any person other than the said owner, of the emblem shown below, in connection with the motor trade, business, profession or occupation:

CHAPTER II
REGULATIONS RELATING TO GAME PARKS
GENERAL REGULATIONS APPLICABLE TO ALL GAME PARKS

9. Without the written approval of the Executive Committee no person except an officer of the Nature Conservation and Tourism Division of the Administration, acting directly in the execution of his duties or in the exercising of his powers, shall in a game park -
- (a) drive a vehicle at any place other than a road which is indicated by a road sign;
 - (b) drive a vehicle on a road in respect of which, in any manner whatsoever, it is indicated that it is closed;
 - (c) drive a vehicle faster than 60 kilometres per hour on any road outside any camping site or rest camp: (, Provided that the provisions of this paragraph shall not be applicable to any proclaimed thoroughfare in the Namib Desert Park or the Skeleton Coast Park;
 - (d) drive a vehicle faster than 20 kilometres per hour within the terrain of any officially designated camping site or rest camp;
 - (e) drive or park a vehicle in such a way that it causes inconvenience to any other person;
 - (f) throw away a burning or smouldering object or put or leave it at a place where it may possibly ignite another object or cause such object to be ignited;
 - (g) roll or throw a stone from any mountain or height or allow it to be thus rolled or thrown;
 - (h) relieve himself anywhere except in the sanitary conveniences provided therefor;
 - (i) make any fire at any place other than at the officially designated fire-places provided for that purpose;
 - (j) make an exceptionally large fire at the officially designated fire-places;
 - (k) throw away, put or leave refuse or rubbish at any place other than in the containers provided therefor;
 - (l) contaminate drinking water in any manner whatsoever;
 - (m) tamper with any water installation;
 - (n) wash clothes or any other object in the water of any lagoon, dam, river or any other water-course;

- (o) use soap or any other washing agent for any purpose whatsoever in the water of a lagoon, dam, river or any other water-course;
 - (p) throw stones, rubbish, bottles, tins, refuse, oil or any other offensive or dangerous object material or liquid into the water of a lagoon, dam, river or other water-course or allow it to land therein;
 - (q) present public entertainment or collect money from the public;
 - (r) trade or distribute any pamphlet, book, handbill or any other written or printed document;
 - (s) organise, hold or address any meeting or assembly;
 - (t) at any time make in the opinion of the officer in charge, unnecessary or undue noise or cause or allow such noise to be made, which may disturb any other person or the game;
 - (u) do or allow anything which may constitute a nuisance or hindrance to the public;
 - (v) take an unsealed fire-arm or air gun in; and
 - (w) draw a caravan at places or on roads where it is prohibited as indicated by notice boards.
10. No person shall, without the permission of the Executive Committee, subject to such conditions as it may deem fit -
- (a) take photos or films for commercial purposes in a game park;
 - (b) make use of blinds or hides in a game park.
11. Any person entering a game park shall, if it is practically possible, report immediately to the nearest officer attached to the management of that game park.
12. Any person who enters a game park shall comply with the Conditions on which leave to enter that game park and reside therein was granted to him and shall obey any legal order given to him by an officer.
13. No person aged 16 years or younger shall be admitted to a game park, unless he is accompanied by an adult who shall be held responsible for him/her.
14. (1) Any person who makes use of or occupies Administration property in a game park shall, to the satisfaction of the officer under whose control such property is, take reasonable and proper care when using or occupying such property and shall leave or return it in the same condition in which he received it.
- (2) If any such property is damaged it shall be reported immediately to the officer under whose control it is, and the compensation determined by him shall be paid immediately.

15. No person shall remove anything whatsoever from any accommodation referred to in regulation 14.
16. Tickets or receipts issued as proof of payment for accommodation or camping sites, any service rendered or any article which has been supplied by an officer in a game park shall be retained by the person to whom it was issued until he leaves the game park and shall be produced to an officer on request.
17. No person shall occupy a camping site or accommodation unless such camping site or accommodation has been allocated to him by an officer.
18. Accommodation and camping sites in game parks shall be vacated before 10h00 on the day following the last day for which it was reserved.
19. No person shall give any tip or intoxicating liquor to a camp servant.
20. No person shall leave a defect vehicle or the wreck of a vehicle in a game park for a period of longer than 7 days after the vehicle became defect or was involved in an accident: Provided that the Administration may remove such defect vehicle or wreck after the expiration of such period and recover the cost involved from the owner thereof.
21. No person shall enter that part of a game park where the residence of an officer or employee of the Administration is situated or camp or stay there without the permission of the officer in charge of the nearest rest camp or another officer authorised by him to grant such permission.
22. (1) An officer in a game park who bears the rank of nature conservator or tourist officer or higher rank may order any person who, in his opinion, commits or has committed an offence in that game park or has, in the opinion of such officer, given offence to another person, to leave that game park and such person shall leave that game park immediately thereafter.
(2) Any person who has been ordered in terms of subregulation (1) to leave a game park, may not enter a game park within a period of six months thereafter except under and by virtue of the special authorisation of the Executive Committee which shall only be granted after consideration of a complete report on the order which was given in terms of subregulation (1) and the incident which led to it.
23. (1) Any person entering a game park does so wholly at his own risk.
(2) The Administration shall not be liable for any damage suffered on account of injuries to persons, whether fatal or not, which occurred in any manner whatsoever in a game park.
(3) The Administration shall not be liable for any loss of or damage to property suffered in a game park or caused on account of fire, theft, the neglect or design of any person or through the action of any animal in a game park.

B. NAMIB DESERT PARK

28. Without the written permission of the Executive Committee, no person except an officer acting directly in the execution of his duties or the exercise of his powers shall -

- (a) drive a vehicle between 21h00 and 05h00 on any road in the Namib Desert Park which is not a proclaimed thoroughfare;
- (b)
 - (i) visit Sandvis or be or stay there at any time between 20h00 and 05h00;
 - (ii) visit Sandvis overland or in a vehicle which is not four-wheel-driven, or which is not specially equipped for travel in heavy sand or with a carrying capacity of more than 1400 kilogram or go further south with a vehicle than the point indicated by means of notice boards;
- (c) gather Firewood in the Namib Desert Park;
- (d) throw away or place or get rid of fish, any part of a fish, fish bait, refuse or rubbish at any other place or by any other means than by placing it in the holders or refuse bins provided therefor unless by putting it on a vehicle and removing it from the game park;
- (e) break a bottle at any place in the Namib Desert Park or cause or allow it to break and leave the pieces there;
- (f) place, leave or throw out books or lines with bait at any place in the Namib Desert Park for any purpose other than that of angling;
- (g) from the beach at Sandvis -
 - (i) catch fish with any kind of net or for commercial purposes;
 - (ii) catch Fish except by means of a fishing rod and reel;
 - (iii) use more than one fishing rod per angler or more than two hooks per line;
 - (iv) angle in the lagoon;
 - (v) catch and keep, give away, present, sell, display for sale or be in possession of any fish of the kinds which are mentioned hereunder, which is smaller than the size mentioned for that kind of fish and if fish smaller than the size referred to is caught, it shall be placed back into the sea without delay and without causing any further injuries:

Dassie, Black tail or Kolstert (*Diplodus sargus*) : 15 cm

Shad or Chad (*Pomatomus saltator*) : 30 cm Galjoen (*Coracinus capensis*) :

20 cm Geelbek or Cape Salmon (*Atractoscion aequidens*) : 40 cm

Hottentot (*Pachymetopon blochii*) : 22 cm Kabeljou, Cob or Kob or Salmon-Bass (*Argirosomus hololepidotus*) : 40 cm Mullett (*Mugil spp.*) : 15 cm
Snoek (*Thyrstites atun*) : 60 cm
Sole (Super) (*Austroglossus microlepis*) : 30 cm
Stockfish (*Merluccius capensis*) : 50 cm
White Steenbras (*Lithognathus aureti*) : 30 cm
White Stumpnose (*Rhabdosargus spp.*) : 20 cm
Garrick (*Lichia amia*) : 38 cm

- (h) (i) collect or remove any mussels or "polychaete" worms or blood worms from Sandvis;
- (ii) use a boat or raft on the lagoon at Sandvis.
29. No person except an officer acting directly in the execution of his duties or the exercise of his powers shall visit the research station at Gobabeb without the written permission of the Executive Committee.
30. A document indicating that a person has the permission referred to in section 18(1) of the Ordinance to visit Sandvis shall at all times be in his possession while he visits Sandvis and shall, on request, be shown to an officer.

C. ETOSHA NATIONAL PARK

31. (1) The portion of the Etosha National Park lying to the east of an imaginary north-south line running through the centre of the water hole known as Sringbokfontein shall, subject to the provisions of these regulations, be open to visitors throughout the year.
- (2) The tourist season during which the remaining portion of the Etosha National Park may be visited shall begin on the second Friday of March and shall end on the 31st day of October of each year. Provided that the Cabinet may, if it is in its opinion expedient, allow any person able to visit the portion of the Etosha National Park contemplated in this subregulation during the closed season, subject to the conditions he may impose.
32. Without the written permission of the Executive Committee no person except an officer acting directly in the execution of his duties or the exercise of his powers, shall -
- (a) stay overnight at any other place in the game park except a rest camp: Provided that if a person must on account of unavoidable circumstances stay overnight at any place in the game park other than a rest camp, it shall be reported at the first possible occasion to an officer,
- (b) enter or travel in the Etosha National Park during the period between sunset and sunrise,

NATURE CONSERVATION ORDINANCE, 1975

ORDINANCE

To consolidate and amend the laws relating to the conservation of nature; the establishment of game parks and nature reserves; the control of problem animals; and to provide for matters incidental thereto.

BE IT ORDAINED by the Legislative Assembly for the Territory of South West Africa, with the consent of the State President, in so far as such consent is necessary, previously obtained and communicated to the Assembly by message from the Administrator, as follows:-

ARRANGEMENT OF SECTIONS.

Section.

PRELIMINARY.

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2. Nature Conservation and Tourism Division.

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NATURE CONSERVATION BOARD.

3. Continued existence of Nature Conservation Board.
4. Constitution of board.
5. Qualifications and disqualifications of members.
6. Period of office.
7. Vacation of office.
8. Termination of membership.
9. Filling of vacancies.
10. Meetings of the board.
11. Functions, powers and duties of the board.
12. Remuneration, allowances and fees.

CHAPTER II.

GAME PARKS AND NATURE RESERVES.

13. Etosha National Park.
14. Establishment and objects of game parks and nature reserves.
15. Amendment of boundaries of game parks and nature reserves.
16. Withdrawal of declaration as a game park or nature reserve.
17. Powers of Executive Committee in relation to game parks and nature reserves.
18. Restriction of right to enter game parks and nature reserves and prohibition of certain acts therein.
19. Purposes for which permission to enter game parks and nature reserves may be granted.
20. Prohibition of hunting in game parks and nature reserves.
21. Killing of animals trespassing in game parks or nature reserves.
22. Establishment of private game parks and private nature reserves.
23. Prohibition of hunting in private game parks.

24. Prohibition of picking of indigenous plants in private nature reserves.

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WILD ANIMALS.

25. Powers of Executive Committee in relation to hunting seasons and classification of game.

26. Hunting of specially protected game.

27. Hunting of protected game.

28. Hunting on Administration property.

29. Right of ownership to huntable game, huntable game birds and exotic game.

30. Hunting of huntable game under owner's authority.

31. Hunting of huntable game by owner of lessee of land.

32. Hunting of huntable game birds under owner's authority.

33. Hunting of huntable game birds by owner or lessee of land.

34. Hunting of exotic game and other wild animals.

35. Lease of hunting rights.

36. Hunting for the sake of trophies and possession and export of trophies.

37. Hunting of game to protect grazing, cultivated lands and gardens.

38. Hunting at night.

39. Powers of land owners in regard to persons found hunting and dogs.

40. Killing capturing and keeping of game and wild animals.

41. Capturing, transport and keeping of game for commercial purposes.

42. Restrictions in regard to tire-arms and capturing apparatus.

43. Use of vehicles and aircraft when hunting and capturing game.

44. Eggs of game birds.

45. Game for scientific purposes.

46. Donation of game and game meat.

47. Sale of game, game meat and the skins of game.

48. Transport of game and game meat.

49. Import and export of game and wild animals and their skins.

50. Prohibition of the removal of game found dead.

51. Inability to give satisfactory account of possession.

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PROBLEM ANIMALS.

52. Application of Chapter.

53. Declaration as problem animal.

54. Hunting of problem animals.

55. Compulsory control of black-backed jackal.

56. Provision of aids.

57. Training of hunters.

- 58. Trade in coyote getters.
- 59. Prohibition of the supply of coyote getters to in competent persons.
- 60. Prohibition of the obtaining of coyote getters by incompetent persons.
- 61. Use of poison and coyote getters.
- 62. Research in regard to problem animals.
- 63. Obstruction of persons in the performance of their duties.
- 64. Limitations in relation to damages.

CHAPTER V.

FISH IN INLAND WATERS.

- 63. Definition of boundaries of lagoons.
- 66. Keeping of fish.
- 67. Angling under permit.
- 68. Manner of angling permissible.
- 69. Executive Committee may prohibit or restrict angling.
- 70. Prohibition in regard to certain materials.
- 71. Offences.

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INDIGENOUS PLANTS.

- 72. Powers of Executive Committee in regard to indigenous plants.
- 73. Picking and transport of protected plants.
- 74. Sale, donation, export and removal of protected plants.
- 75. Exemption to owner of nursery.
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- 80. Certificate of appointment
- 81. Powers, functions and duties of nature conservators and honorary nature conservators.
- 82. Exemptions.
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- 84. Regulations.
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2. Definition of the boundaries of the Etosha National Park.
3. Specially protected game.
4. Protected game.
5. Hunttable game.
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7. Application for a game dealer's licence
8. Game dealer's licence.
9. Protected plants.

PRELIMINARY.

Definitions.

1. In this Ordinance, unless the context otherwise indicates -

(i) "**adequate fence**" in relation to a farm means -

(a) a boundary fence which along the whole length thereof is at least 1,22 metres high and has been erected -

(i) with training post planted in at most 500 metres from each other

(ii) with middle post of iron or hardwood which -

(aa) in the case of iron post, have a mass of at least four kilograms each; or

(bb) in the case of hardwood posts, are at least 100 millimetres in diameter at the thin end; and

(cc) are planted in to a depth of at least 600 millimetres and at most 20 metres from the nearest straining post and from each other;

(iii) with iron droppers, or droppers of hardwood which are at least 35 millimetres in diameter at the thin end;

(iv) with at least five galvanised steel wire strands or, three galvanised steel wire strands and jackal-proof fencing; and

(v) with gates which are at least of the same height as the boundary fence and are of such a nature that they do not in any manner impair the efficacy of the boundary fence, but does not include such a boundary fence in which a game-trap has been constructed or of which any portion has been removed, damaged, cut, flattened or raised or is in such a bad state of repair that the efficacy of such boundary fence is impaired;

(b) in the case of devising line between two farms along which, in the opinion of the Cabinet, it is impracticable or inexpedient to erect a fence, any indication of the boundary line between the said farms in respect of which the Director has, after agreement by the owners of the farms concerned, with the approval of the Cabinet certified that it indicates the boundary lines in all respects; (Act27/'86/1(a)

(ii) "**big game**", in relation to hunttable game, means the following species of such game, namely buffalo, eland, onyx and kudu; and (A6/88/1 (b)

(iii) "**angle**" in relation to fish means the use of a line and fish - hook, whether a rod is used or not; and includes the use of a landing or keepnet to land or keep fish caught by means of a line and fish-hook; (xiv)

(iv) "**artificial lure or spoon**", for the purposes of Chapter V, means any device which by its simulation of life or by its colour or appearance is designed to delude or entice a fish into seizing such device; (xxiii)

(v) "**board**" means the Nature Conservation Board referred to in section 3; (xxxiv)

- (vi) “**catch**” and capture include the use of any means or method to catch, capture, injure or immobilise fish, game or any other wild animal; (xxiii)
- (vii) “**certificate of competency**” means a certificate of competency issued in terms of section 57(3); (vi)
- (viii) “**children**” means the natural children, step-children and lawfully adopted children of a person, and includes the husband or wife of any such child; (xxii)
- (ix) “**communal land**” means land which, in terms the constitution of the representative authority of a population group, or any other law, is communal land of population group concerned, but does not include any surveyed piece of such land if the ownership of such piece of land has at any time been transferred to any person by or under the authority of the executive authority of such representative authority, or under any ordinance of that representative authority or any other law administered by or under the control of that executive authority, by means of the registration of a title deed in any deeds office, whether the period which, in terms of the constitution or an ordinance of that representative authority, is to elapse after the date of such registration before such piece of land ceases to be communal land, has transpired or not;(A27/86/1(c)
- (x) “**coyote getter**” means the device known as “coyote getter” or a similar device; (xiii)
- (xi) “**Director**” means the Director of Nature Conservation and Tourism referred to in section 2; (vii) (A27/861(d)
- (xii) “**Directorate**” means the directorate of Nature Conservation and Recreation Resorts referred to in section 2; (A27/86/1(e)
- (xiii) “**Executive Committee**” means the Administrator - in - Executive Committee referred to in section 6 of the South West Africa Constitution Act, 19689 (Act 39 of 1968); (xxvi).
- (xiv) “**exotic game**” means any vertebrate (including any bird, fish or reptile) whether kept or bred in captivity or elsewhere, belonging to non-domestic species the habitat of which is not in the Republic of South Africa or the Territory; (xli)
- (xv) “**fish**” includes aquatic fauna in general (excluding mammals and birds) whether indigenous or exotic, as well as the eggs, brood or spawn thereof; (xlvi)
- (xvi) “**fisheries**” includes all waters and all fish therein; (xlviii)
- (xvii) “**fishing tackle**” means any fishing tackle, apparatus or device, or any part thereof, commonly used for the catching of fish; (xlvii)
- (xviii) “**game**” means specially protected game, protected game, huntable game, huntable game birds and exotic game; (liii)
- (xix) “**game meat**” means the meat of any game, whether fresh, salted, smoked or dried, or in the process of being smoked or dried; includes the bones in, or attached to, such meat; and also comprises the whole carcass of any game which is dead; (lv)
- (xx) “**game park**” means the Etosha National Park referred to in section 13(1), and any area declared a game park in terms of section 14(1); (lvi)
- (xxi) “**game-proof fence**” in relation to any species of game means a fence which complies with the standard prescribed for a game-proof fence in relation to that species of game but does not include any such fence in which a game-trap has been constructed or of which any portion has been removed, damaged, cut, flattened or raised or is in such a bad state of repair that the efficacy of such fence is impaired; (A27/86/1(f) 1)
- (xxii) “**game-trap**” means any corridor-shaped passage in a fence along which any game or other wild animals can pass spontaneously through such a fence or can be lured to pass through such a fence, but not any such passage approved by the Director (A27/86/1(g)
- (xxiii) “**honorary nature conservator**” means any person appointed as an honorary nature conservator in terms of section 79(2) and includes any person who is an honorary nature conservator in terms of section 79(3); (ix)
- (xxiv) “**hunt**” -
- (a) for the purposes of any provision of this Ordinance, excluding a provision of Chapter IV, means by any means whatsoever to kill or attempt to kill, or to shoot or attempt to shoot at, or to pursue, to search for, to lie in wait for or to drive with intent to kill or to shoot at, or wilfully to disturb;

(b) for the purposes of any provision of Chapter IV, means to -

(i) search for, trace, lie in wait for or pursue problem animals;

(ii) set a trap, spring-trap, net, drug, poison or any other means or device approved by the Director to capture or kill problem animals

(iii) shoot at, or with dogs to hunt for, problem animals;

(iv) kill or capture problem animals in any other manner whatsoever approved by the Director; (xviii)

(xxv) "**hunnable game**" means every species of game mentioned in Schedule 5, or either sex thereof; (xix)

(xxvi) "**hunnable game birds**" means every species of game birds mentioned in Schedule 6 or either sex thereof; (xx)

(xxvii) "**hunting season**" in relation to hunnable game or hunnable game birds means the period determined in terms of section 25 as the hunting season during which such hunnable game or hunnable game birds may be hunted in terms of section 30 or section 32, as the case may be; (xxi)

(xxviii) "**indigenous plant**" means a species of plant, shrub or tree which is indigenous to the Territory, irrespective of whether it is or has been cultivated and whether it is no longer growing in a wild state or has for some period not been growing in a wild state and includes the flower, seed, fruit, bulb, tuber, stem or root or any other part of such plant, shrub or tree, but not any plant declared under any law to be a weed; (xvii)

(xxix) "**keep**" means to have game or wild animals in possession or custody, to supervise such game or wild animals and to be in full control thereof; (i)

(xxx) "**lessee**" in relation to a farm or land or land on which waters are situated, means the person leasing such farm or land under a written contract with the owner thereof, and who actually resides on such farm or land, but does not include the lessee of a piece of land forming part of communal land, unless such piece of land is a surveyed piece of land which is represented on a diagram approved by the surveyor-general in terms of the Land Survey Act, 1927 (Act 9 of 1927); (A27/86/1 (h))

(xxxi) "**licensed game dealer**" means any person licensed as a game dealer in terms of section 41; (xi)

(xxxii) "**local authority**" means a municipality or village management board or the Peri-Urban Development Board established under section 2 of the Peri-Urban Development Board Ordinance, 1970 (Ordinance 19 of 1970); (xxviii)

(xxxiii) "**nature conservator**" means -

(a) a nature conservator appointed in terms of section 79(1); and

(b) any member of the security forces; (xxv) (A 27 / 86/ 1(i) (b))

(xxxiv) "**nursery**" means sufficiently enclosed premises on which protected plants are cultivated for commercial purposes: Provided that such premises shall not be less than 45 square metres in extent; (xxiv)

(xxxv) "**officer**" means any person in the service of the Administration; (iii) (A 27/86/1 (g))

(xxxvi) "**owner**" in relation to a farm; land or land on which waters are situated, means

(a) the person who is registered in a deeds registry as the owner of such farm or land, and includes every director of a company registered in a deeds registry as the owner of such farm or land; or (sec. 1/ Ord 4/77)

(b) the lawful heir of the owner referred to in paragraph (a) at the death of such owner; or

(c) where such farm or land is subject to a usufruct, the usufructuary thereof; or

(d) where such farm or land, except a farm or land forming part of communal land is owned by the Government; or (A 27/86/1 (k))

(dA) where such farm or land forms part of the communal land of a population group, or is owned by the representative authority of a population group but is not communal land of the population group concerned, the executive authority of that population group; or; (A27/86/1(l)(dA))

(e) where such farm or land is owned by a local authority, the town clerk or the secretary of such local authority; (vii)

- (xxxvii) “**parents**” means the parents of whom a person is the natural child, stepchild or lawfully adopted child, and includes the husband or wife of any such parent; (xxvi)
- (xxxviii) “**pick**” includes to cut off, chop off, pick off, take, gather, uproot, damage or destroy; (xxix)
- (xxxix) “**population group**” means a population mentioned in section 3 of the Representative Authorities Proclamation, 1980 (Proclamation AG 8 of 1980) (A 27/86/1(m))
- (xl) “**prescribed**” means prescribed by regulation; (1)
- (xli) “**private game park**” means any area declared a private game park in terms of section 22; (xxxix)
- (xlii) “**private nature reserve**” means any area declared a private nature reserve in terms of section 22; (xxx)
- (xliii) “**problem animal**” means any animal declared a problem animal in terms of section 53: (xxxii)
- (xliv) “**proclaimed road**” means a proclaimed road as defined in the Roads Ordinance, 1972 (Ordinance 17 of 1972); (xii)
- (xlv) “**protected game**” means every species of game mentioned in Schedule 4, or either sex thereof; (v)
- (xlvi) “**protected plant**” means every species of plant mentioned in Schedule 9; (iv)
- (xlvii) “**public road**” means a public road as defined in the Road Traffic Ordinance, 1967 (Ordinance 30 of 1967); (xxxiii)
- (xlviii) “**raw**” in relation to a skin means a skin which has not been prepared or tanned till it is soft; (xxvii)
- (xlix) “**regulation**” means a regulation made and in force under Ordinance; (xxv)
- (l) “representative authority” means a representative authority established as such by law for a population group and consisting of the legislative authority and executive authority of that population group; (A27/86/1(n))
- (li) “**road reserve**” in relation to a proclaimed road means the road reserve of such road as defined in the Roads Ordinance, 1972 (Ordinance 17 of 1972); (xxvii)
- (lii) “**Secretary**” means the Secretary of Agriculture and Nature Conservation (xxxviii) (Act 27/’86 sec.1(o))
- (liii) “**security forces**” means the South West African Police or the South African Defence Force; (A 27/86/1/ (p))
- (liv) “**sell**” means to sell, barter, offer or expose for sale or offer as valuable consideration; (xlv)
- (lv) “**set line**” means a line and fish-hook which, when used for catching fish, is not under the immediate supervision of a person but is attached to something, but shall not include a line and fish-hook attached to a reel and rod lying loose on the ground; (xxxix)
- (lvi) “**skin**” includes any Portion of a skin; (xliv)
- (lvii) “**small game**” in relation to huntable game, means the following species of such game, namely, bushpig, springbok and warthog; (A 6/88/1 (b))
- (lviii) “**specially protected game**” means every Species of game mentioned in Schedule 3, or either sex thereof; (xxxvii)
- (lix) “**Territory**” means the Territory of South West Africa; (x)
- (lx) “**this Ordinance**” includes any proclamation and any regulation made and in force thereunder; (xv)
- (lxi) “**Trophy**” means the skin, shell, feet or head, or any part thereof; of game or any other wild animal, but shall not include any such skin, shell, feet or head, or any part thereof; which has lost its original identity as a result of a *bona fide* manufacturing process; (xl)
- (lxii) “**waters**” includes waters in rivers, streams, creeks, lakes, lagoons, pans, vleis, dams, reservoirs, furrows and ponds; (lii)
- (lxiii) “**weapon**” means any fire-arm, Spear, assegai, bow -and - arrow, axe, bushknife, knife or similar object and includes any narcotic rifle, pistol or bow; (li)
- (lxiv) “**wild animal**”-

(a) for the purposes of any provision of this Ordinance, excluding a provision of Chapter IV, means any Vertebrate (including any bird, fish and reptile), Whether kept or bred in captivity or elsewhere, belonging to a non-domestic species and the habitat of which is in the Republic of South Africa or the Territory;

(b) for the purposes of any provision of Chapter IV, means any vertebrate (including any bird, fish and reptile) belonging to a nondomestic species (liv)

Nature Conservation and Tourism Division.

2. A division of the Department of Agriculture and Nature Conservation, to be known as the Directorate of Nature Conservation and Recreation Resorts, shall be responsible for the regulation, execution and administration of matters concerning the conservation of nature and tourism recreation resorts, and the head of such division shall be an officer having the official title of Director of Nature Conservation and Recreation Resorts appointed by the Cabinet subject to the provisions of the Government Service Act, 1980 (Act 2 of 1980). (A 27/86/2)

CHAPTER I.

NATURE CONSERVATION BOARD.

Continued existence of Nature Conservation Board.

3. The Nature Conservation Board established in terms of section 58 of the Nature Conservation Ordinance, 1967 (Ordinance 31 of 1967), shall, notwithstanding the repeal of that Ordinance by this Ordinance, continue to exist.

Constitution of board

4. (1) The board shall consist of at least five and not more than ten members appointed by the Cabinet; and (A 27/86/3(a))

(2) One of the members of the board shall be designated by the Executive Committee as chairman and one as vice-chairman of the board.

(3) Any person who immediately prior to the commencement of this Ordinance is the chairman or another member of the board, shall be deemed to have been designated or appointed in terms of the provisions of this Ordinance as chairman or member of the board, as the case may be, as from the date on which he became. the chairman or a member thereof.

(4) The Secretary may, subject to the provisions of the Government Service Act, 1980 (Act 2 of 1980), instruct an officer in the Directorate to act as secretary of the board. (A 27/86/3(b))

Qualifications and disqualification, of members.

5. No person shall be appointed or hold office as a member of the board, if he-

(a) has at any time been convicted of any offence for which he has been sentenced to imprisonment without the option of a fine, unless he has received a free pardon, or unless the period of imprisonment expired at least three years before the date of his appointment; or

(b) is of unsound mind and has been so declared by a competent court; or

(c) is an unrehabilitated insolvent; or

(d) is under the age of 21 years.

Period of office

6. (1) A member of the board shall be appointed for a period of three years.

(2) Any person whose period of office as a member of the board has expired, shall be eligible for reappointment.

Vacation of office

7. A member of the board shall vacate his office -

(a) if he ceases to possess the qualifications mentioned in section 5, or becomes subject to the disqualification mentioned therein;

(b) if he is removed from his office in terms of section 8;

(c) if he resigns as a member.

Termination of membership.

8. The Executive Committee may at any time remove any member of the board from his office if such member of the board -

(a) has in the opinion of the Executive Committee-

(i) been guilty of improper conduct; or

(ii) regularly neglected his duties as a member of the board; or

(iii) become, or becomes incompetent for the execution or performance of his duties as a member of the board; or

(b) has, without the permission of the chairman of the board, which consent shall not be granted for any period exceeding six consecutive months, been absent from four consecutive meetings of the board.

Filling of vacancies.

9. When any member of the board for any reason ceases to hold office, the Executive Committee may, with due observance of the provisions of sections 4(1) and 5 appoint a person to fill the vacancy on the board.

Meetings of the board.

10. (1) All ordinary meetings of the board shall be held at the times and places determined by the board: Provided that, if the board has not determined the time and place for its next ordinary meeting at the end of a meeting, the chairman of the board shall determine such time and place.

(2) The chairman of the board shall, when directed by the Executive Committee to do so, and may, when he deems it necessary or expedient, call a special meeting of the board to be held at a time and place determined by the Executive Committee, or by the chairman, as the case may be.

(3) The majority of all the members of the board shall be a quorum for a meeting of the board.

(4) At all meetings of the board the chairman, or if he is absent, the vice-chairman, shall preside and if both the chairman and vice-chairman are absent from a meeting of the board the members present shall from among themselves elect a person to preside at that meeting.

(5) (a) Subject to the provisions of paragraph (b) a decision of the majority of the members of the board present at any meeting of the board, shall constitute a decision of the board, and such a decision of the board shall be final and conclusive.

(b) In the event of an equality of votes in regard to any matter the person presiding at the meeting concerned shall have a casting vote in addition to his deliberative vote.

(6) Minutes shall be kept of all meetings of the board.

(7) No decision taken by the board or act performed under the authority or on the recommendation of the board shall be invalid by reason only of an interim vacancy on the board or of the fact that a person who is disqualified from being a member of the board sat or acted as a member of the board when the decision was taken or the act was performed or authorised or recommended, if the decision was taken or the act was performed or authorised or recommended by the requisite majority of the members of the board who were present at the time and were entitled to sit and to act as members.

Function, powers and duties of the board.

11. (1) The functions, powers and duties of the board shall be -

(a) to advise the Executive Committee in relation to the control, management and maintenance, with due observance of the objects mentioned in sections 13(1) and 14(1), of the Etosha National Park and other game parks;

(b) to investigate and report on all matters relating to nature conservation referred to the board by the Executive Committee;

(c) to make such recommendations to the Executive Committee as it may deem fit on any matter relating to the conservation of nature and the amendment of the laws of the Territory relating to the conservation of nature;

(d) at least once in every year to make recommendations to the Executive Committee in respect of applications for game dealers' licences and the prescribing of the levies referred to in section 83(2);

(e) to exercise and perform the functions, powers and duties prescribed by regulation;

(f) to fulfil those other tasks which fall within the objects of this Ordinance and are entrusted to the board by the Executive Committee.

(2) Any person who hinders, obstructs, resists or disturbs the board as such or any member of the board in the performance of its or his duties, or the exercise of its or his functions or powers, shall be guilty of an offence.

Remuneration. allowances and fees,

12. A member of the board shall receive no remuneration, but to those members of the board who are not officers in, or employees of the government service, shall be paid such allowances and fees as may be determined by the Cabinet from time to time. (A 27/86/4)

CHAPTER II.

GAME PARKS AND NATURE RESERVES.

Etosha National Park.

13. (1) The area defined in Schedule 2 and known as the Etosha National Park shall be a game park for the propagation, protection, study and preservation therein of wild animal life, wild plant life and objects of geological, ethnological, archaeological, historical and other scientific interest and for the benefit and enjoyment of the inhabitants of the Territory and other persons.

(2) The boundaries of the Etosha National Park shall be amended by ordinance only.

(3) No emergency grazing shall be allowed in the Etosha National Park.

Establishment and objects of game parks and nature reserves.

14. (1) The Executive Committee may declare any area a game park or a nature reserve for the propagation, protection, study and preservation therein of the wild animal life, fisheries, wild plant life and objects of geological, ethnological, archaeological, historical and other scientific interest and for the benefit and enjoyment of the inhabitants of the Territory and other persons.

(2) Any such declaration of an area as a game park or a nature reserve shall be made known by notice in the *Official Gazette*.

Amendment of boundaries of game parks and nature reserves.

15. (1) The Executive Committee may from time to time amend the boundaries of any game park (except those of the Etosha National Park) or any nature reserve.

(2) Any such amendment of the boundaries of a game park or nature reserve shall be made known by notice in the *Official Gazette*.

Withdrawal of declaration as a game park or nature reserve.

16. (1) The Executive Committee may at any time withdraw the declaration of an area as a game park or a nature reserve.

(2) Any such withdrawal of the declaration of any *area as* a game park or a nature reserve shall be made known by notice in the *Official Gazette*.

Powers of executive Committee in relation to game parks and nature reserves.

17. (1) The Executive Committee shall control, manage and maintain game parks and nature reserves.

(2) The Executive Committee may within a game park or a nature reserve -

(a) lay out and construct such roads, bridges, buildings, water installations, fences, breakwaters, seawalls, boathouses, landing stages, mooring places and swimming pools and carry out such other works as it may consider necessary for the control, management or maintenance of the game park or nature reserve;

(b) take such steps as will ensure the safety of the animal and plant life and fisheries in the game park or nature reserve and the conservation of the game park or nature reserve and the animals, vegetation and fish therein in a natural state;

(c) reserve areas as breeding places for animals or fish or nurseries for trees, shrubs, plant's and flowers and set aside zones for such purposes as it may deem necessary or desirable;

(d) provide accommodation for visitors to the game park or nature reserve and facilities in connection therewith;

(e) provide meals and refreshments to visitors to the game park or nature reserve against payment of the fees determined by the Executive Committee from time to time, tariffs of which shall be displayed at a prominent place at the restaurant or other place where such meals and refreshments are Provided: Provided that the Executive Committee may so determine different tariffs for different game parks and nature reserves;

(f) carry on any business or trade for the convenience of visitors to the game park or nature reserve;

(g) supply any other service for the convenience of visitors to the game park or nature reserve;

(h) establish, erect, equip and maintain any building, structure, depot or premises required in connection with any matter referred to in paragraph (a), (e), (f) or (g), or let any premises required for such a purpose;

(i) make such charges in connection with any such matter as it may determine;

(j) authorise any person to carry on, subject to such conditions and the payment of such charges as it may deem fit, any activities which may be carried on by the Executive Committee in terms of paragraph (e), (f) or (g)

Restriction of right to enter game parks and nature reserves and prohibition, of certain acts therein.

18. (1) Notwithstanding anything to the contrary in this Ordinance contained, but subject to the provisions of subsection (2) and sections 19 and 21, no person shall without the written permission of the Executive Committee -

(a) enter or reside in a game park or a nature reserve;

(b) convey into a game park or a nature reserve or, within the confines thereof be in possession of, any weapon, explosive, trap or poison;

(c) within a game park or a nature reserve wilfully or negligently injure, capture or disturb any animal or remove or destroy any egg or nest of any bird;

(d) wilfully or negligently cause any veld fire or any damage to any object of geological, ethnological, archaeological, historical or other scientific interest within a game park or a nature reserve;

(e) introduce any animal into or permit any live-stock or domestic animal to enter a game park or a nature reserve;

(f) remove from a game park or a nature reserve any animal, whether dead or alive, or any part of an animal, other than an animal lawfully introduced into such game park or nature reserve;

(g) pick any indigenous plant in a game park or a nature reserve;

(h) chop, cut or destroy any tree in a game park or a nature reserve:

Provided that -

(i) a member of the security forces acting officially and whose action is directly connected with the exercise of his official duties shall be exempted from the provisions of paragraphs (a), (b) and (e), except those provisions of paragraph (b) relating to the conveyance into or possession in a game park or nature reserve of any trap or poison; and

(ii) an officer of the Directorate, or a member of the board acting officially and whose action is directly connected with the exercise of his official duties or with the execution of the powers vested in him in terms of this Ordinance shall be exempted from all the provisions of this subsection. (A 27/86/5]

(2) Notwithstanding the provisions of subsections (1) but subject to the conditions, requirements and restrictions prescribed or imposed by or in terms of this Ordinance, any person may-

(a) travel in a vehicle along a prescribed route through a prescribed game park or nature reserve;

(b) convey an animal or an object mentioned in subsection (1)(b) in a vehicle along a prescribed route through a prescribed game park or a nature reserve.

(3) Any person who contravenes or fails to comply with any provision of this section or any condition, requirement or restriction of any permission granted thereunder shall be guilty of an offence and liable on conviction to a fine not exceeding five hundred rand or to imprisonment for a period not exceeding six months or to both such fine and such imprisonment.

Purposes for which permission to enter game parks and nature reserves may be granted.

19. The permission to enter and reside in a game park or a nature reserve mentioned in section 18(1) (a) may be granted only for the purposes of -

(a) health, study, recreation or other incidental matters;

(b) travel or transport along the routes prescribed by regulation; or

(c) transacting any lawful business.

Prohibition, of hunting in game parks and nature reserves.

20. (1) Notwithstanding anything to the contrary in this Ordinance contained, no person shall, without the written permission of the Executive Committee, hunt any animal in any game park or any nature reserve: Provided that a dangerous animal may be killed in defence of a human life or to prevent a human being from being injured.

(2) Any person who contravenes or fails to comply with any provision of subsection (1) or any condition requirement or restriction of any permission granted thereunder, shall be guilty of an offence and liable on conviction -(Act 31/90/1)

(a) to a fine not exceeding R 200 000 or to imprisonment for a period of not exceeding twenty years or to both such fine and such imprisonment if such offence relates to the hunting of any elephant or rhinoceros; or (A 27/86/6)

(b) to a fine not exceeding R20 000 or to imprisonment for a period of not exceeding five years to both such fine and such imprisonment if such offence relates to the hunting of any other specially protected game.

Killing of animals trespassing in game parks or nature reserves.

21. A nature conservator may at any time-

(a) kill any dog found in a game park or a nature reserve, other than any such dog which is in the lawful possession or under the lawful charge of an officer or a member of the security forces or which is being conveyed through such game park or nature reserve in accordance with the provisions of section 18.

(b) kill any donkey, horse or other riding or pack-animal found in a game park or a nature reserve, other than any such donkey, horse or other riding or pack-animal which is in the lawful possession or under the lawful charge of an officer or a member of the security forces or which is being conveyed through such game park or nature reserve in accordance with the provisions of section 18, and may seize the saddles and bridles thereof, if any;

(c) with the consent of the Cabinet, kill any live-stock or domestic animal found in a game park or a nature reserve, other than any such live-stock or domestic animal which is in the lawful possession or under the lawful charge of an officer or which is being conveyed through such game park or nature reserve in accordance with the provisions of section 18. (A27/86/7)

Establishment of private game parks and private such conditions as it may deem necessary nature reserves.

22. (1) (a) Subject to the provisions of subsections (2), (3), (4) and (5) the Executive Committee may at any time and subject to expedient declare any area a private game park or private nature reserve for the period determined by it or until the declaration of the area concerned as a private game park or private nature reserve is withdrawn.

(b) Any such declaration of an area as a private game park or a private nature reserve shall be made known by notice in the *Official Gazette*.

(2) An area shall only be declared a private game park or a private nature reserve on the written application of the owner of the land concerned.

(3) (a) No area shall be declared a private game park or a private nature reserve unless a notice of the application to do so has at least three months previously at the cost of the applicant been published in the *Official Gazette* and in two newspapers circulating in the Territory.

(b) The notice referred to in Paragraph (a) shall request any person who wishes to object to the declaration of the area concerned as a private game park or a private nature reserve to lodge his objections with the person or officer mentioned in the notice within a period mentioned in the notice, which objection shall be submitted to and considered by the Executive Committee together with the application concerned.

(4) (a) The Executive Committee may at any time withdraw the declaration of an area as a Private game park or a private nature reserve.

(b) Any such withdrawal of the declaration of an area as a private game park or a private nature reserve shall be made known by notice in the *Official Gazette*.

(5) The declaration of an area as a private game park or a private nature reserve shall in no way derogate from the provisions of Chapter IV and shall apply subject to the provisions of the said Chapter IV.

Prohibition of hunting in private game parks.

23. (1) Notwithstanding anything to the contrary in this Ordinance contained, but subject to the provisions of Chapter IV, no person shall without the written approval of the Executive Committee hunt any game or any other wild animal or bird in a private game park: Provided that the owner of the land concerned may at any time hunt any game or any other wild animal Or bird on such land, except specially Protected and Protected game.

(2) The Executive Committee shall not grant any approval in terms of subsection (1) unless the Owner of the land concerned has granted his permission thereto.

(3) The approval referred to in subsection (1) shall be granted subject to the conditions, requirements and restrictions imposed by the Executive Committee with due allowance for the permission of the owner of the land concerned.

(4) Any person who contravenes or fails to comply with any provision of subsection (1) or any condition, requirement or restriction of any approval granted in terms of this section *shall* be guilty of an offence and liable on conviction-

(a) to a fine not less than One thousand one hundred and fifty rand and not exceeding two thousand five hundred rand or to imprisonment for a period of not less than two years and not exceeding six years or to both such fine and such imprisonment if such relates to the hunting of specially offence protected game;

(b) to a fine not less than seven hundred and fifty rand and not exceeding one thousand five hundred rand or to imprisonment for a period of not less than twelve months and not exceeding three years or to both such fine and such imprisonment if such offence relates to the hunting of any other game or wild animal.

Prohibition of picking of indigenous plant, in private nature reserves.

24.(1) No person shall without the written approval of the Executive Committee pick any indigenous plant, or any Portion of an indigenous plant, in a private nature reserve: Provided that the owner of the land concerned may at any time pick any indigenous plant, other than a protected plant, on such land.

(2) The Executive Committee shall not grant any approval in terms of subsection (1) unless the owner of the land concerned has granted his permission thereto.

(3) The approval referred to in subsection (1) shall be granted subject to the conditions, requirements and restrictions imposed by the Executive Committee with due allowance for the permission of the owner of the land concerned.

(4) Any person who contravenes or fails to comply with any provision of subsection (1) or any condition, requirement or restriction of any approval granted in terms of this section, shall be guilty of an offence and liable on conviction to a fine not exceeding five hundred rand or to imprisonment for a period not exceeding six months or to both such fine and such imprisonment.

CHAPTER III. WILD ANIMALS.

Power, of Executive Committee in relation to hunting seasons, and classification of game.

25. (1) The Executive Committee may from time to time-

(a) in any year determine hunting seasons during which game mentioned in Schedule 5 or 6 or Schedules 5 and 6 or any species or sex thereof may be hunted in terms of the provisions of section 30 or 32 or sections 30 and 32, as the case may be, but subject to the other provisions of this Ordinance;

(b) restrict the number of any species or sex of game *which* may be hunted during a hunting season;

(c) amend Schedules 3, 4, 5 and 6 by deleting the name of any species or sex of game or by transferring such name from any such schedule to another or by adding to any such schedule the name of any species or sex of wild animal which is not included in any of the said schedules.

(2) Any determination of a hunting season, restriction of a species or sex of game which may be hunted during a hunting season or amendment of Schedule 3, 4, 5 or 6 in terms of subsection (1) shall be made known *by* notice in the Official Gazette.

(3) Any hunting season or amendment of any such schedule may, subject to the provisions of subsection (4), be made applicable to the entire Territory or to any part or parts of the Territory defined in such notice. (GN 90/88)

(4) No amendment of such schedules whereby the name of any species or sex of game is transferred from Schedule 5 or Schedule 6 to Schedule 3 or Schedule 4 or whereby the name of any species or sex of wild animal is added to Schedule 3 or Schedule 4 shall be applicable in respect of -

(a) any farm; or

(b) any piece of land

which is not less than one thousand hectares in extent and is enclosed with a game-proof fence.

Hurting of specially Protected game.

26. (1) No person other than the lawful holder of a permit granted by the Executive Committee shall at any time hunt any specially protected game.

(2) A permit granted in terms of this section authorises the lawful holder thereof subject to the conditions, requirements and restrictions imposed by or under this Ordinance to hunt the number and species of specially protected game mentioned therein at the time and place mentioned therein.

(3) Any person who contravenes or fails to comply with any provision of subsection (1) or any condition, requirement or restriction of a permit granted in terms this section shall be guilty of an offence and liable on conviction to a fine not exceeding R 6000 or to imprisonment for a period not exceeding six years or to both such fine and such imprisonment. (A 27/86/8 (a); Act 31/90/2)

(4) (a) No provision contained in this section shall prohibit the owner or lessee of land or occupier of communal land from killing specially protected game on such land in defence of a human life or to prevent a human being from being injured or to protect the life of any livestock, poultry or domestic animal of such owner, lessee or occupier whilst the life of such livestock, poultry or domestic animal is actually being threatened. (A27/86/8(b))

(b) Any person who kills specially Protected game in terms of the provisions of this subsection shall report it in writing to the nearest nature conservator or at the nearest police office within ten days thereafter.

(c) Any person who fails or neglects to comply with the provisions of Paragraph (b) shall be guilty of an offence.((5) (6) and (7) added A 27/86/8(c))

(5) Any person who hunts specially protected game under a permit granted in terms of this section, shall at all times have such permit in his possession while he is so hunting.

(6) Any person who has hunted any specially protected game under a permit granted in terms of this section, shall endorse -

(a) the species of specially protected game and the number of each of such species which he has hunted under such permit;

(b) the date on which he has so hunted it; and

(c) the name of the farm or a description of the land on which he has so hunted it, on such permit in ink or indelible pencil and shall sign it before he leaves the farm or land on which he has hunted such specially protected game.

(7) Any person who contravenes or fails to comply with any provision of subsection (5) or (6), shall be guilty of an offence.

Hunting of protected game.

27. (1) No person other than the lawful holder of a permit granted by the Executive Committee shall at any time hunt any protected game.

(2) A permit granted in terms of this section authorises the lawful holder thereof subject to the conditions, requirements and restrictions imposed by or under this Ordinance to hunt the number and species of Protected game mentioned therein at the time and place mentioned therein.

(3) Any person who contravenes or fails to comply with any provision of subsection (1) or any condition, or restriction of a permit granted in terms this section, shall be guilty of an offence, and liable on conviction to a fine not exceeding R 4 000 or to imprisonment for a period not exceeding four years or to both such fine and such imprisonment (A27/86/9(a))

(4) Notwithstanding anything to the contrary in this Ordinance contained, the owner or lessee of a farm or piece of land which is not less than one thousand hectares in extent may, if such farm or piece of land is enclosed with jackal- proof fencing, at any time and by any means whatsoever kill any ant bear or honey badger found on such farm or piece of land and any steenbok which is lawfully on such farm or piece of land shall be deemed to be huntable game to which such owner or lessee shall have the right of ownership: Provided that -

(a) for the purposes of the provisions of this subsection "owner" shall not include a town clerk or the secretary of a local authority;

(b) for the purposes of the provisions of this subsection relating to steenbok, "lessee" shall not include the lessee of a farm or land, who is not the owner of the huntable game, huntable game birds and exotic game on such farm or land.

(5) (a) No provision contained in this section shall prohibit the owner or lessee or of land or occupier of communal land from killing protected game on such land in defence of a human life or to prevent a human being from being injured or to protect the life of the livestock, Poultry or domestic animal of such owner, lessee or occupier whilst the life of such livestock, poultry or domestic animal is actually being threatened. (A27/86/9 (b))

(b) Any person who kills protected game in terms of the provisions of this subsection shall report it in writing to the near

(c) Any person who fails or neglects to comply with the provisions of paragraph (b) shall be guilty of an offence.

(6) Any person who hunts protected game under a permit granted in terms of this section, shall at all times have such permit in his possession while he is so hunting.

(7) Any person who has hunted any protected game under a permit granted in terms of this section, shall endorse -

(a) the species of protected game and the number of each of such species which he has hunted under such permit;

(b) the date on which he has so hunted it; and

(c) the name of the farm or a description of the land on which he has so hunted it, on such permit in ink or indelible pencil and shall sign it before he leaves the farm or land on which he has hunted such protected game.

(8) Any person who contravenes or fails to comply with any provision of subsection (6) or (7), shall be guilty of an offence.(A.27/86/9(c) (6) (7) and (8) added)

Hunting on Administration property.

28. (1) (a) Subject to the provisions of Chapter IV no person shall, without the written permission of the Cabinet, hunt any huntable game, huntable game bird or exotic game or any other wild animal on any land, including communal land, owned by the Government of the Territory or a representative authority.

(b) For the purposes of paragraph (a) land leased by the Government of the Territory or a representative authority shall, unless an intention to the contrary appears from lease, and unless, in the case of communal land, the land leased is an unsurveyed piece of land, be deemed not to be land owned by the Government of the Territory.

(c) Any person who contravenes or fails to comply with any provision of paragraph (a) or any condition, requirement or restriction of any written permission granted thereunder, shall be guilty of an offence and liable on conviction to a fine not exceeding R 4 000 or to imprisonment for a period not exceeding four years, or to both such fine and such imprisonment.

(2) (a) Any person who hunts any huntable game, bird or exotic game or any other wild animal under the written permission of the Cabinet granted in terms of this section, on land, including communal land, owned by the Government of the Territory or a representative authority, shall at all times have such written permission in his possession while he is so hunting.

(b) Any person who contravenes or fails to comply with any provision of paragraph (a) shall be guilty of an offence. (A27/86/10)

Right of ownership to huntable game, huntable game birds, and exotic game.

29. (1) The owner of -

(a) a farm which is enclosed with a game-proof fence or an adequate fence;

(b) any piece of land which is not less than one thousand hectares in extent and enclosed with a game-proof fence,

shall, subject to the provisions of this Ordinance, be the owner of all huntable game, huntable game birds and exotic game on such farm or piece of land as long as such huntable game, huntable game birds and exotic game are lawfully on such farm or piece of land and as long as such farm or piece of land remains to be enclosed in that manner.

(2) The lessee of

(a) a farm which is enclosed with a game-proof fence or an adequate fence;

(b) any piece of land which is not less than one thousand hectares in extent and enclosed with a game-proof fence,

shall, subject to the provisions of this Ordinance, and unless the contract under which he leases such farm or piece of land specifically provides otherwise, be the owner of all huntable game huntable game birds and exotic game on such farm or piece of land as long as such huntable game, huntable game birds and exotic game are lawfully on such farm or piece of land and as long as such farm or piece of land remains to be enclosed in that manner.

Hunting of huntable game.

30. (1) (a) Save as is otherwise provided in this Ordinance, no person other than the lawful holder of a permit granted by the Cabinet shall hunt any huntable game

(aA) Subject to the provisions of this ordinance, a permit for the hunting of huntable game shall be granted -

(i) only if the person who applies for a permit produces a written authority granted to him in accordance with the provisions of paragraph (b); and

(ii) only in respect of the hunting of such huntable game, and the number of each such species, mentioned in the written authority referred to in paragraph (b), but in no case in respect of huntable game exceeding the one or the other of the following number:

- (aa) three head of big game; or
- (bb) two head of big game and four head of small game; or
- (cc) one head of big game and eight head of small game; or
- (dd) twelve head of small game:

Provided that the limitations mentioned in sub-paragraph (ii) (aa), (bb), (cc) and (dd) shall not apply in the case in the case where a permit is granted for the hunted of huntable game on a farm which is enclosed with a game - proof fence. (A6/88(a))

(b) The written authority referred to in paragraph (aA) - (A6/88/2(b), A6/88/2(c))

(i) shall be granted only by the owner or lessee of a farm which is enclosed with a game-proof fence or an adequate fence or by the owner or lessee of a piece of land which is not less than one thousand hectares in extent and enclosed with a game-proof fence;

(ii) shall be granted by such owner or lessee only in respect of the hunting of huntable game which is on such farm or piece of land and of which he is the owner in terms of this Ordinance: Provided that such Owner shall not grant any such authority in respect of the hunting of any such huntable game of which he is the owner but has leased the right to hunt it;

(iiA) shall be granted by such owner or lessee only in respect of the hunting of huntable game not exceeding the one or the other of the following numbers of such game, namely:

- (aa) three head of big game; or
- (bb) two head of big game and four head of small game; or
- (cc) one head of big game and eight head of small game; or
- (dd) twelve head of small game:

Provided that the provisions of this subparagraph shall not apply to the owner or lessee of a farm which is enclosed with a gameproof fence.

(iii) shall be in ink or indelible pencil and shall contain -

- (aa) the name and full residential address of the person by whom such authority is granted;
- (bb) the name and full residential address of the person to whom such authority is granted;
- (A6/88/2(d), A6/88/2(e))

(cc) the date or dates within the hunting season on which hunting under such authority is authorised;

(dd) subject to the provisions of paragraph (iiA), the species of huntable game, and the number of each such species, which may be hunted under such authority; and

(ee) the name of the farm or a description of the piece of land on which may be hunted under such authority,

and shall be signed by the person granting such authority. (A6/88/2(d), A6/88/2(e))

(bA) The permit referred to in paragraph (a) shall authorise the person to whom it is granted subject to the conditions, requirements and restrictions prescribed or imposed by or under this Ordinance, to hunt on the date or dates within the hunting season mentioned therein, the species of huntable game, and the number of each such species mentioned therein, on the farm or farms mentioned therein or the piece of land described therein. (A6/88/2(f))

(c) Any person who contravenes or fails to comply with any provision of paragraph (a) or (bA) or any condition, requirement or restriction of any permit granted in terms of this subsection, shall be guilty of an offence and liable on conviction to a fine not less than five hundred rand and not exceeding seven hundred

and fifty rand or to imprisonment for a period of not less than six months and not exceeding twelve months or to both such fine and such imprisonment. (A 27/86/11, A 6/88/2(g))

(2) Any person who hunts huntable game under any permit granted in terms of this section shall at all times have such permit in his possession while he is so hunting. (A 6/88/2(h))

(3) Any person who has hunted any huntable game under a permit granted in terms of this section, shall endorse -

(a) the species of huntable game, and the number of each such species, which he has hunted under such permit;

(b) the date on which he has so hunted it; and

(c) the name of the farm or a description of the land on which he has so hunted it,

on such permit in ink or indelible pencil and shall sign it before he leaves the farm or the piece of land on which he has hunted such huntable game. (A 6/88/2(i))

(4) Any person who contravenes or fails to comply with any provision of subsection (2) or (3), shall be guilty of an offence.

(5) Notwithstanding the provisions of section 47, any person who grants a written authority in terms of this section, may claim and recover the amount (if any) agreed upon with the person to whom such written authority was granted, from such person in respect of any huntable game hunted under such written authority.

(6) Subject to the provisions of the proviso to subparagraph (aA) of subsection (1), no permit or permits shall be granted to any person in terms of that subsection which would result in such person being authorised to hunt in any given hunting season in total more than one or other of the following numbers of huntable game, namely:

(a) three head of big game; or

(b) two head of big game and four head of small game; or

(c) one head of big game and eight head of small game; or

(d) twelve head of small game. (A6/88/2(j)(6))

Hunting of huntable game by Owner or lessee of land.

31. (1) Notwithstanding anything to the contrary in this Ordinance contained, the owner or lessee of a farm which is enclosed with a game proof fence or an adequate fence or of a piece of land which is not less than one thousand hectares in extent and enclosed with a game-proof fence may hunt any huntable game on such farm or piece of land throughout the year without a permit referred to in section 30 (i)(a). (A6/88/3(a))

(2) The owner or lessee of a farm or piece of land referred to in subsection (1) may exercise the rights granted to him by the said subsection personally and also through his wife or one or more of his children and his parents as well as through any employee permanently employed by him and resident on such farm or piece of land, provided such white employee has his written permission: Provided that if such owner or lessee is by reason of physical disability unable to exercise such rights and neither his wife, nor his children, parents or white employees as mentioned above are available to do so, the Cabinet may, on application by such owner or lessee, authorise any officer or other person whom it considers competent in writing to exercise such rights for and on behalf of such owner or lessee.

(2A) (a) The owner or lessee of a farm or piece of land referred to in subsection (1), shall not later than the last day of November of every year provide the Director with a return stating the species of huntable game, and the number of each such species, which have been hunted by him personally, or for and on his behalf, on such farm or piece of land during the preceding period of twelve months in terms of the provisions of this section.

(b) Any person who fails or neglects to comply with the provisions of paragraph (a) shall be guilty of an offence. (A27/86/12(a),A6/88/3(b))

(3) For the purposes of this section -

(a) “owner” shall not include the town clerk or the secretary of a local authority or the executive authority of a representative authority or any member of such a representative authority; (A 27/86/12 (b))

(b) “lessee” shall not include the lessee of a farm or land, who is not the owner of the huntable game on such farm or land.

Hunting of huntable game birds under owner’s authority.

32. (1) (a) Save as is otherwise provided in this Ordinance, no person other than the lawful holder of a written authority granted in accordance with the provisions of this section, shall hunt any huntable game birds.

(b) The written authority referred to in paragraph (a)-

(i) shall be granted only by the owner or lessee of a farm which is enclosed with a game proof fence or an adequate fence or by the owner or lessee of a piece of land which is not less than one thousand hectares in extent and enclosed with a game-proof fence;

(ii) shall be granted by such owner or lessee only in respect of the hunting of huntable game birds which is on such farm or piece of land and of which he is the Owner in terms of this Ordinance: Provided that such owner shall not grant any such authority in respect of the hunting of any such huntable game birds of which he is the owner but has leased the right to hunt it;

(iii) shall be in ink or indelible pencil and shall contain

(aa) the name and full residential address of the person by whom such authority is granted;

(bb) the name and full residential address of the Person to whom such authority is granted;

(cc) the date or dates on which hunting under such authority is authorised;

(dd) the species of huntable game birds, and the number of each such species which may be hunted under such authority; and

(ee) the name of the farm or a description of the piece of land on which may be hunted under such authority,

and shall be signed by the person granting such authority before it is handed by him to the person to whom it is granted.

(iv) shall authorise the person to whom it is granted subject to the conditions, requirements and restrictions imposed by or under this Ordinance, to hunt on the date or dates mentioned therein (which date or dates shall not be outside the hunting season) the species of huntable game, and the number of each such species mentioned therein, on the farm or farms mentioned therein or the piece of land described therein.

(2) Any person who hunts huntable game under any written authority granted in terms of this section shall at all times have such written authority in his possession while he is so hunting: Provided that any person who is so hunting need not at all times have such written authority in his possession while he is so hunting if the person who has granted him such written authority accompanies him at all times while he is so hunting.

(3) Any person who has hunted any huntable game birds under a written authority granted in terms of this section, shall endorse

(a) the species of huntable game birds, and the number of each such species, which he has hunted under such authority;

(b) the date on which he has so hunted it; and

(c) the name of the farm or a description of the land on which he has so hunted it, on such authority in ink or indelible pencil and shall sign it before he leaves the farm or the piece of land on which he has hunted such huntable game birds.

(4) Any person who contravenes or fails to comply with any provision of this section or any condition, requirement or restriction of any written authority granted in terms of this section, shall be guilty of an offence.

(5) Notwithstanding the Provisions of section 47, any person who grants a written authority in terms of this section, may claim and recover the amount (if any) agreed upon with the person to whom such written authority was granted, from Such person in respect of any huntable game birds hunted under such written authority.

Hunting of huntable game birds by owner or lessee of land.

33. (1) Notwithstanding anything to the contrary in this Ordinance contained, the owner or lessee of any land may -

(a) if such land is enclosed in such a manner that the boundaries thereof are clearly indicated, throughout the year hunt any huntable game birds on any part of such land;

(b) if such land is not enclosed in such a manner that the boundaries thereof are clearly indicated, throughout the year on any cultivated lands and in any gardens on such land hunt any huntable game birds which destroy or damage crops or plants on such cultivated lands or in such gardens.

(2) The owner or lessee of land referred to in subsection (1) may exercise the rights granted to him by the said subsection personally and also through his wife or one or more of his children or his parents as well as through any employee permanently employed by him and resident on such land provided such employee has his written permission: Provided that, if such owner or lessee is by reason of physical disability unable to exercise such right and neither his wife, nor his children, parents or employees as mentioned above are available to do so, the Cabinet may on application by such owner or lessee authorise any officer or other person whom it considers competent in writing to exercise such rights for and on behalf of such owner or lessee. (A27/86/13(a))

(3) For the purposes of this section -

(a) "owner" shall not include the town clerk or the secretary of a local authority or the executive authority of a representative authority or any member of such an executive authority;(A27/86/13(b))

(b) "lessee" shall not include the lessee of a farm or land, who is not the owner of the huntable game birds on such farm or land.

Hunting of exotic game and other wild animals.

34. (1) Save as is otherwise provided in this Ordinance, no person shall hunt any exotic game, unless he is the lawful owner thereof or has the written permission of the lawful owner thereof, or is the owner of the land on which such game trespasses.

(2) Save as is otherwise provided in this Ordinance, no person shall hunt any wild animal which is not game as defined in section 1 on any land, unless he has the written permission of the owner or lessee of such land.

(3) Any person who hunts any exotic game or any wild animal referred to in subsection (2) under a written permission granted in terms of subsection (1) or (2). shall at all times have such written permission in his possession while he is so hunting: Provided that any person who is so hunting need not at all times have such written authority in his possession while he is so hunting if the person who has granted him such written authority accompanies him at all times while he is so hunting.

(4) Any person who contravenes or fails to comply with any provision of subsection (1) or (2) shall be guilty of an offence and liable on conviction to a fine not less than seven hundred an fifty rand and not exceeding one thousand five hundred rand or to imprisonment for a period of not less than twelve months and not exceeding three years or to both such fine and such imprisonment.

Lease of hunting rights.

35. (1) The owner of a farm or land, who, in terms of this Ordinance, has the right to hunt huntable game, huntable game birds and exotic game on such farm or land may lease that right to any other person, in which case no other person than the lessee of such right shall have the right to hunt huntable game, huntable game birds or exotic game on such farm or land.

(2) Any contract in terms of which the right to hunt huntable game huntable game birds or exotic game is leased, shall-

(a) be a written contract;

(b) be entered into for a period of at least six months; and

(c) indicate explicitly whether such right refers to huntable game, huntable game birds, exotic game, or two or more thereof. (suspended by section 1 Ordinance 16/ 80)

(3) Any lease in terms of subsection (1) of the right to hunt huntable game, huntable game birds or exotic game on a farm or land, shall lapse on the sale of the farm or land in respect of which it was leased.

Hunting for the sake of trophies, and possession and export of trophies.

36. (1) (a) Notwithstanding anything to the contrary in this Ordinance contained, the Executive Committee may allow any person from any country or territory under a permit granted by the Executive Committee to hunt the species of game, and the number (but not exceeding two) of each such species determined by the Executive Committee and mentioned in such permit, in the Territory for the sake of trophies.

(b) For the purposes of paragraph (a) any game that has been shot at by virtue of a permit granted under that paragraph, and that was wounded when thus being shot at, shall in all respects be regarded as having been hunted by virtue of such permit. (suspended by section 2 (a) Ordinance 16/ 80)

(2) Subject to the provisions of section 49 no person shall without the written permission of the Executive Committee import any trophies into the Territory or export any trophies from the Territory.

(2A) (a) No person shall manufacture any articles either wholly or partially from a trophy or trophies for the purposes of sale unless he is licensed under this section as a manufacturer of articles from trophies.

(b) No person shall sell, offer for sale or display for the purposes of sale any trophies or adapted trophies unless he is licensed under this section as a seller of trophies and adapted trophies.

(c) The licences contemplated in paragraph (a) and (b) shall be issued by the executive committee in the prescribed fees.

(d) The licences required under this subsection shall not in lieu of but supplementary to any other permit, licence, registration, approval, permission or exemption required by law.((2A-suspended by sec.2 (b) Ord.16/ 80))

(3) No person, other than the lawful holder of a permit granted by the Executive Committee, shall be in possession of any elephant tusk or rhinoceros horn or any portion of an elephant tusk or rhinoceros horn: Provided that the provisions of this subsection shall not prohibit any person from being in possession of-

(a) the tusk of any elephant or the horn of any rhinoceros which he has lawfully hunted or imported into the Territory in accordance with the provisions of this Ordinance;

(b) any portion of an elephant tusk or rhinoceros horn which has lost its original identity as a result of a bona fide manufacturing process.

(4) Any elephant tusk or rhinoceros horn found in the Territory as *res nullius* shall be the property of the state and shall be disposed of as the Cabinet may determine from time to time.(A 27/ 86/ 14 (b))

(5) Any person who contravenes or fails to comply with any provision of this section or any condition, requirement or restriction of a permit, licence or permission granted in terms of this section, shall be guilty of an offence. (suspended by section 2 (c) Ordinance 16/80)

Hunting of game to protect grazing, cultivated lands and gardens.

37. (1) (a) Notwithstanding anything to the contrary in this Ordinance contained-

(i) the owner or lessee of land or any employee in the permanent service of such owner or lessee, may hunt any game, excluding elephant, hippopotami and rhinoceros, destroying or damaging crops or plants on any cultivated land on such land: Provided that no game shall be hunted in accordance with the provisions of this subparagraph during the period from half an hour after sunset on any day to half an hour before sun rise on the following day, unless such cultivated land is not fence less than one hundred hectares in extent and enclosed with a game- proof prescribed in respect of kudu; (A 27/ 86/ 15)

(ii) any occupier of communal land may hunt any game, excluding elephant, hippopotami and rhinoceros, destroying or damaging crops or plants on any cultivated land on such communal land which has been laid out and is being cultivated by such occupier, provided such cultivated land is enclosed with a fence approved by the Director.

(b) Any person who kills any game in terms of the Provisions of this subsection shall report it in writing to the nearest nature conservator or at the nearest police office within ten days thereafter.

(c) Any person who fails or neglects to comply with the Provisions of Paragraph (b) shall be guilty of an offence.

(2) (a) Whenever the Executive Committee is convinced that it is necessary to protect grazing on a farm or any other land it may grant a permit to the owner or lessee of such farm or land authorising him, notwithstanding anything to the contrary in this Ordinance contained but subject to the conditions, requirements and restrictions which is imposed when such permit is granted, within the period mentioned in such permit to hunt on such land the species of game, and the number thereof, mentioned in such permit: Provided that-

(i) if a company is the owner or lessee of such farm or land, such permit shall be issued to a director of such company or any other person nominated by such company;

(ii) if a local authority is the owner or lessee of such farm or land, such permit shall be issued to a person nominated by the council or board of such local authority;

(iii) if the lessee of such farm or land applies for permission to hunt huntable game, huntable game birds or exotic game in terms of such permit, the Executive Committee shall grant such permit only after consultation with the owner of such huntable game, huntable game birds or exotic game.

(b) Any person to whom a permit referred to in paragraph (a) was granted, who contravenes or fails to comply with any condition, requirement or restriction of such permit, shall be guilty of an offence.

(3) If at the trial of a person on a charge for the contravention of section 30 or section 32, it appears from the evidence that the game, the subject of the charge, was lawfully killed in terms of the provisions of subsection (1), but that the accused failed or neglected to report the killing thereof in accordance with the said subsection (1) such Person may be convicted of a contravention of the said subsection (1).

(4) Any game killed lawfully in terms of this section, shall be the lawful property of the Person who so killed it.

Hunting at night.

38. (1) Subject to the provisions of section 37 and Chapter IV, no person shall without the permission of the Executive Committee hunt any game or other wild animal, other than a problem animal-

(a) with the aid of artificial light;

(b) during the period from half an hour after sunset on any day to half an hour before sunrise on the following day.

(2) Any person who contravenes or fails to comply with any provision of this section or any condition, requirement or restriction of any permission granted in terms of this section, shall be guilty of an offence and liable on conviction to a fine not exceeding five hundred rand or to imprisonment for a period not exceeding six months or to both such fine and such imprisonment.

Powers of land owners in regard to persons found hunting and dogs.

39. (1) Whenever-

(a) the owner or lessee of land; or

(b) the lessee of the right to hunt huntable game, huntable game birds and exotic game on a farm or land; or

(c) any other person authorised thereto in writing by any owner or lessee referred to in paragraph (a) or (b),

comes across a person who is engaged in hunting game on such farm or land he may request the person who is so engaged in hunting immediately to produce his permit, authority or permission to hunt such game on such farm or land, and if the person who is so engaged in hunting refuses or fails immediately to produce such permit, authority or permission, he may be ordered by the first-mentioned person to furnish his true name and address and immediately to leave the farm or land, and any person who refuses or fails to obey such order. may be arrested by the person who gave the order.

(2) Whenever-

(a) the occupier of land owned by the Government of the Territory; or (A27/86/16(a))

(b) any other person authorised thereto in writing by the Executive Committee,

comes across any person who is engaged in hunting game or any other wild animal (other than a problem animal) on such land, he may request the person who is so engaged in hunting such game or wild animal immediately to produce his permit or permission to hunt such game or wild animal on such land, and if the person so engaged in hunting such game or wild animal refuses or fails immediately to produce such permit or permission, he may be ordered by the first-mentioned person to furnish his true name and address and immediately to leave the land concerned. and any person who refuses or fails to obey such order may be arrested by the person who gave the order.

(3) The occupier of land owned by the Government of the Territory and the owner or lessee of any other land may immediately destroy any dog chasing game or any other wild animal on such land (except a dog chasing such game or wild animal in accordance with the Provisions of Chapter IV) as well as any dog which is found on such farm or land and which is not under the proper control of an adult or cause any such dog to be destroyed. (A27/86/16(b))

(4) Any person who-

(a) contravenes or fails to comply with any provision of this section;

(b) refuses or fails immediately to produce any permit, authority or permission when requested in terms of subsection (1) or (2) to do so;

(c) refuses or fails to furnish his true name and address, or furnishes a name or address which is not his true name or address when ordered in terms of subsection (1) or (2) to furnish his true name and address;

(d) refuses or fails immediately to leave the farm or land concerned when ordered in terms of subsection (1) or (2) to do so,

shall be guilty of an offence.

Catching, capturing and killing of game and wild animals.

40. (1) (a) Subject to the provisions of this Ordinance, no person shall without a permit granted by the Executive Committee intentionally-

(i) kill game or any other wild animal by any means other than by shooting with a firearm;

(ii) capture game or any other wild animal by means of a snare, pitfall, trap, springtrap, net, birdlime, drug or any other device or means whatsoever or by any method whatsoever;

(iii) keep game or any other wild animal..

(b) The provisions of this subsection shall by no means prohibit the owner or lessee of land from killing or capturing wild animals not being game as defined in section 1, on such land for any purpose whatsoever.

(c) The provisions of this subsection shall not apply to the killing and capturing of reptiles and rodents not being game as defined in section 1: Provided that no person other than a licensed game dealer shall capture any such reptiles or rodents for commercial or scientific purposes without, the written permission of the Executive Committee.

(d) The Cabinet may, in its discretion grant exemption from any or all the provisions of this subsection to the owner or lessee of a farm which is enclosed with a game-proof fence or of a piece of land which is not less than one thousand hectares in extent and which is enclosed with a game-proof fence, or to a licensed game dealer or to any member or the the members of any particular population group residing on the communal land of the population group concerned. (A27/86/17(a))

(e) (i) The Executive Committee may, in its discretion, exclude any species of exotic game from the provisions of this subsection relating to the keeping of game.

(ii) The name of any species of exotic game which is so excluded from the provisions of this subsection, shall be made known by notice in the *Official Gazette*.

(2) Notwithstanding anything to the contrary contained in subsection (1) and section 41, but otherwise subject to all the provisions of this Ordinance and any other law in force in the Territory relating to the care for and the keeping, transport, sale and export of game, the owner or lessee of a farm or any piece of land not being less than one thousand hectares in extent may with the aid of helpers under his personal

supervision, for any purpose whatsoever capture and keep game on such farm or piece of land, provided such farm is enclosed with a game-proof fence and the Director has previously in writing approved the method whereby and the equipment with which such owner or lessee intends to capture such game: Provided that-

(i) the Cabinet may at any time in its discretion direct that any such owner or lessee shall only capture such game under the supervision of an officer of the Directorate;

(ii) such owner or lessee may engage any person approved by the Cabinet (whether in general or for that specific case) to capture such game in such manner. (A27/86/17(b))

(3) (a) The Executive Committee may in its discretion and in respect of such game, wild animals, birds and reptiles as it may determine, grant exemption from any or all of the provisions of this section to a person who is the holder of a licence authorising him to sell pets.

(b) An application for the exemption referred to in paragraph (a) shall be made in a form approved by the Secretary and shall be submitted to the Director.

(4) Any person who contravenes or fails to comply with any provision of this section or any condition, requirement or restriction of any permit, approval, permission or exemption granted or any instruction given in terms of this section, shall be guilty of an offence.

(5) For the purposes of the provisions of this section excluding the provisions of subsection (1) (b), "lessee" shall not include the lessee of a farm or land, who is not the owner of the huntable game, huntable game birds and exotic game on such farm or land. (A6/88/4,)

40A. Any person who, whether personally or through any other person-

(a) without the consent of the owner or lessee of a farm or piece of land, drives or in any other manner forces or lures any game or other wild animals to trek from such farm or piece of land to any other farm or piece of land;

(b) removes, damages, cuts, flattens or raises any game-proof fence or adequate fence or constructs a game-trap in such a fence or allows a game trap to exist therein with intent to drive or lures any game or other wild animals from any farm or piece of land, without the consent of the owner or lessee of such farm or piece of land, to any other farm or piece of land or to allow game animals to pass or escape from such first-mentioned farm or piece of land to such other farm or piece of land,

shall be guilty of an offence and liable on conviction to a fine not exceeding R 4 000 or to imprisonment for a period not exceeding four years or to both such fine and such imprisonment. (A 27/ 86/ 18)

Capturing, transport and keeping of game for commercial purposes.

41. (1) Subject to the provisions of sections 40(1) (b) and 40(2) no person shall capture, transport or keep game or any other wild animal for commercial purposes unless he is licensed as a game dealer: Provided that the provisions of this subsection shall by no means prohibit any person who has captured or is keeping game or any other wild animal for commercial purposes in terms of the provisions of section 40(1) (b) or 40(2), from transporting such game for commercial purposes.

(2) Application for a game dealer's licence shall be made in the form set out in Schedule 7.

(3) A game dealer's licence shall be granted by the Executive Committee, and shall be issued in the form set out in Schedule 8.

(4) A game dealer's licence-

(a) shall be valid for the period from the first day of April in any year or, if it is issued after that day, from the day of issue, up to and including the thirty-first day of March following that day: Provided that a game dealer's licence which was issued for the calendar year 1975 in terms of an ordinance repealed by section 90, shall remain valid up to and including the thirty-first day of March, 1976;

(b) may be renewed annually; and

(c) shall not be transferable.

(5) An amount of one hundred rand shall be payable at the issue of every new game dealer's licence and at any renewal of a game dealer's licence.

(6) Every licensed game dealer shall keep a register in the form and in the manner prescribed by regulation, of all game and other wild animals which he captures, buys, sells, breeds, exchanges or barter and disposes of, and which dies..

(7) (a) The Executive Committee may in its discretion grant exemption from any or all of the provisions of this section to any person who is the holder of a licence authorising him to sell pets, in regard to such game and other wild animals as it may determine and which shall be mentioned in such exemption.

(b) An application for the exemption referred to in paragraph (a) shall be made in a form approved by the Secretary and shall be submitted to the Director.

(8) Any person who contravenes or fails to comply with any provision of this section, or any Provision, restriction or condition of a licence or an exemption granted in terms of this section, shall be guilty of an offence.

Restrictions in regard to fire-arms and capturing apparatus.

42. (1) No person shall use a revolver, pistol or automatic fire-arm when hunting game or use a fire-arm of which the bullet has an energy at the muzzle of the barrel which is lower than the following when hunting the species of game indicated thereunder:

(a) 5400 joules:
Buffalo.

(b) 2700 joules:
Eland
Kudu
Oryx
Wildebeest
Hartebeest
All species of exotic game.

(c) 1350 joules:
Springbok
Duiker:

Provided that the Executive Committee may for the purposes of this subsection by regulation differentiate between the calibre of different fire-arms in respect of different Species of game.

(2) No person shall when hunting the Species of game mentioned in subsection (1) (b) or (c) use cartridges with bullets commonly known as "solid".

(3) No person shall convey any fire-arm otherwise than in a securely fastened case or cover along any public road in the Territory' unless such person is the owner or lessee of the land upon which such road is situated or has the right to hunt game or any other wild animal on such land.

(4) Subject to the Provisions of Chapter IV no person shall-

(a) bring or cause to be brought, or be in possession of, any snare, trap, springtrap, net, birdlime or any other device or means whatsoever, intended or suitable for the capture of any game or other wild animal or, subject to the Provisions of subsection (3), a fire-arm;

(b) make any pitfall,

onto, or on, any land on which any game or other wild animals may presumably be found, unless such person is the owner or lessee of such land or unless such owner or lessee has previously given permission in writing to the person concerned to bring the article concerned onto such land or to make a pitfall on such land, and the said owner or lessee may destroy or render harmless any such article as aforementioned, which may have been brought onto such land without his permission: Provided that the provisions of paragraph (a) shall not apply to any stocks held by a licensed game dealer.

(5) Any person who contravenes or fails to comply with any provision of this section, shall be guilty of an offence.

Use of vehicles and air-craft when hunting and capturing game.

43. (1) Any person who, during a hunting expedition shoots at game out of or from a moving motor vehicle or an aircraft, or who, for any Purpose whatsoever, including that of filming or photography, wilfully drives game by means of a motor vehicle or an aircraft, shall be guilty of an offence: Provided that the Executive Committee may grant exemption from the Provisions of this section prohibiting him from using motor vehicles and aircraft so to capture, to drive away or to shoot at game, to-

- (a) the owner or lessee of a farm or land-
 - (i) desiring to drive away or shoot at game in accordance with the provisions of section 37 (1);
 - (ii) desiring to capture game on such farm or land in accordance with the provisions of section 40 (1) or (2);
- (b) a licensed game dealer desiring to capture game in accordance with the provisions of this Ordinance.

(2) Any exemption referred to in subsection (1) may be granted in general or to a specific person or in respect of a specific occasion.

Eggs of game birds.

44. (1) No person other than the lawful holder of a permit granted by the Executive Committee shall at any time remove, disturb, destroy, sell, hawk or purchase the eggs of huntable game birds or those protected birds mentioned in Schedule 4 (ii): Provided that if an owner or lessee of land may hunt such birds without a permit, he may remove the eggs of such birds without a permit for his own use.

(2) A permit issued in terms of this section shall state the kind of egg and the number thereof which may be removed, disturbed, destroyed, sold, or purchased thereunder.

(3) Any person who contravenes or fails to comply with any provision of this section, or any condition, requirement or restriction of a permit issued in terms of this section, shall be guilty of an offence.

Game for scientific purposes.

45. (1) Whenever the Executive Committee is satisfied that any species of game or wild animal is required by a public museum, zoological garden or scientific institution, or that any species of game or wild animal is required for scientific purposes or for domestication or acclimatisation, it may grant a permit to any person authorising him to hunt, kill, capture or keep such game or wild animal at the time, place or locality mentioned in such permit, notwithstanding anything to the contrary contained in this Ordinance, but subject to the conditions, requirements and restrictions mentioned in such permit.

(2) On granting any permit referred to in subsection (1) the Executive Committee may also determine the method by means of which such game or wild animal or any product derived from such game or wild animal, may or shall be disposed of.

(3) Any person who contravenes or fails to comply with any condition, requirement or restriction of any permit granted in terms of this section, shall be guilty of an offence and liable on conviction -

(a) in the case of a permit concerning specially protected or protected game, to a fine not less than two hundred and fifty rand and not exceeding one thousand five hundred rand or to imprisonment for a period of not less than three months and not exceeding three years or to both such fine and such imprisonment;

(b) in the case of a permit concerning huntable game or any other game or wild animal except huntable game birds, to a fine not less than one hundred rand and not exceeding five hundred rand or to imprisonment for a period of not less than one month and not exceeding six months or to both such fine and such imprisonment;

(c) in the case of a permit concerning huntable game birds, to the penalties prescribed by section 87.

Donation of game and game meat.

46. (1) (a) No person shall donate any game or game meat to any other person: Provided that-

(i) the owner or lessee of a farm or a piece of land or any other person who has lawfully captured or who is lawfully keeping game in accordance with the provisions of this Ordinance may at any time donate any game which he has so captured or which he is so keeping in accordance, with the provision

of this Ordinance to any other person who is the owner or lessee of a farm or land in the Territory or to whom a permit or licence has been granted in terms of this Ordinance authorising him to keep such game or to export it from the Territory;

(ii) the owner or lessee of a farm which is enclosed with a game-proof fence, or a piece of land which is not less than one thousand hectares in extent and which is enclosed with a game-proof fence may at any time donate the game meat of any game which he has lawfully hunted in accordance with the provisions of this Ordinance on such farm or piece of land, to a single person above the age of eighteen years or to the head of a family (irrespective of the size of the family) or to any church denomination, association, institution, organisation, society or body approved by the Executive Committee;

(iii) the owner or lessee of any other farm or land may, during the hunting season only donate the game meat of any game which he has lawfully hunted in accordance with the provisions of this Ordinance on such farm or land, to a single person above the age of eighteen years or to the head of a family (irrespective of the size of the family), or to a church denomination, association, institution, Organisation, society or body approved by the Executive Committee;

(iv) any person who has lawfully acquired game meat from someone else in accordance with the provisions of this Ordinance may, in the hunting season only, donate such game meat to a single person above the age of eighteen years or to the head of a family (irrespective of the size of the family), or to a church denomination, association, institution, organisation, society or body approved by the Executive Committee.

(b) Not more game meat than the meat of-

- (i) one eland, oryx, kudu or buffalo; or
- (ii) four springbok, warthogs or bush-pigs; or
- (iii) twelve huntable game birds

in any period of thirty days, shall be donated in terms of the provisions of paragraph (iii) or (iv) of the proviso to paragraph (a), by any person to any other person to whom he may so donate it.

(c) Any person who contravenes or fails to comply with any provision of paragraph (a) or (b), shall be guilty of an offence.

(2) (a) No person shall receive any game or game meat as a gift from any person other than a person who may donate it to him in terms of this -Ordinance.

(b) Any person who contravenes or fails to comply with any provision of paragraph (a), shall be guilty of an offence.

(3) (a) Any person who donates any game or game meat to any other person or to a church denomination, association, institution, organisation, society or body, shall at the time of delivering or handing over such game or game meat, hand to the person to whom it is so delivered or handed over, a document in which -

- (i) the name and the residential address of the donor;
 - (ii) the date on which and the place at which such game or game meat is delivered or handed over;
 - (iii) a description of the game or game meat so donated;
 - (iv) the name of the person, church denomination, association, institution, organisation, society or body to whom or to which such game or game meat is so donated;
 - (v) the name and the residential address of the person to whom such game or game meat is being delivered or handed over; and
 - (vi) the signature of the donor,
- is indicated fully in ink or indelible pencil.

(b) Any person who contravenes or fails to comply with any provision of paragraph (a), shall be guilty of an offence.

(4) Any person who is in possession of game or game meat as a result of a donation without being in possession of a document referred to in subsection (3), shall be guilty of an offence.

(5) The provisions of subsections (1) up to and including (4) shall not apply in respect of-

- (i) a gift of game or game meat made to his parents or children by the owner or lessee of a farm or land;
- (ii) to a gift of game meat, other than the meat of huntable game birds, of less than ten kilograms.

(6) Any person who furnishes false information in respect of any provision of this section, or who makes a false entry in a document referred to in subsection (3), shall be guilty of an offence.

(7) For the purposes of this section “lessee” shall not include the lessee of a farm or land, who is not the owner of the huntable game, huntable game birds and exotic game on such farm or land.

Sale of game, game meat and skins of game.

47. (1) No person shall sell-

- (a) any game or game meat; or
- (b) the skins of any game which is obviously under the age of one year:

Provided that -

(i) the owner or lessee of a farm which is enclosed with a game-proof fence or a piece of land which is at least one thousand hectares in extent and which is enclosed with a game-proof fence, may sell any game or game meat or any such skins originating from that farm or that piece of land;

(ii) the owner or lessee of a farm which is enclosed with an adequate fence may sell any game or game meat or any such skins originating from that farm with the written permission of the Executive Committee, which permission may be granted subject to the conditions determined by the Executive Committee, including in the case where such game is to be hunted for commercial purposes, a condition indicating the person or persons by whom such game shall be hunted;

(iii) any licensed butcher may, with the written permission of the Cabinet, sell any game meat which he has acquired from the owner or lessee of a farm or land in terms of the provisions of paragraph (i) or (ii) of this proviso; (A 27/86/19)

(iv) any licensed game dealer may sell any game which he has in his possession in accordance with the provisions of this Ordinance;

(v) any church denomination, association, institution, organisation, society or body approved by the Executive Committee may, with the written permission of the Executive Committee, sell any game or game meat which such church denomination, association, institution, organisation, society or body has obtained in terms of the provisions of this Ordinance, at a public function.

(2) No person shall purchase-

- (a) game or game meat; or
- (b) the skins of game obviously under the age of one year,

knowing it to be game or game meat or such skins: Provided that nothing in this subsection contained shall prohibit any person from purchasing-

(i) from the owner or lessee of a farm or a piece of land any game or game meat or skins; or

(ii) from a licensed butcher any game meat; or

(iii) from a licensed game dealer any game; or

(iv) from any church denomination, association, institution, organisation, society or body any game or game meat

which such owner or lessee of a farm or piece of land, licensed butcher, licensed game dealer, church denomination, association, institution, organisation, society or body may sell to him in terms of this Ordinance.

(3) (a) Any person who sells any game, game meat or the skin of game obviously under the age of one year to any other person or to a church denomination, association, institution, organisation, society or body shall, at the time of delivering or handing over such game, game meat or skin, hand to the person to whom it is so delivered or handed over, a document in which-

(i) the name and the residential address of the seller;

(ii) the date on which and the place at which such game, game meat or skin is delivered or handed over,

(iii) a description of the game, game meat or skin so sold:

(iv) the name and the residential address of the purchaser;

(v) the name and the residential address of the person to whom such game, game meat or skin is being delivered or handed over; and

(vi) the signature of the seller

is indicated fully in ink or indelible pencil

(b) Any person who contravenes or fails to comply with any provision of paragraph (a), shall be guilty of an offence.

(c) Any person who, as a result of the purchase thereof is in possession of game, game meat or the skin of game obviously under the age of one year without being in possession of a document referred to in paragraph (a), shall be guilty of an offence.

(4) No person shall, in any newspaper or otherwise, advertise the sale of

(a) any game or game meat; or

(b) the skins of game obviously under the age of one year:

Provided that nothing in this subsection contained shall prohibit-

(i) the owner or lessee of a farm or a piece of land from advertising the sale of any game, game meat or such skins;

(ii) any licensed butcher from advertising the sale of any game meat;

(iii) any licensed game dealer from advertising the sale of any game;

(iv) any church denomination, association, institution, organisation, society or body from advertising the sale of any game or game meat

which such owner or lessee of a farm or piece of land, licensed butcher, licensed game dealer, church denomination, association, institution, organisation, society or body may sell in terms of this Ordinance.

(5) For the purposes of this section-

(a) "lessee" shall not include the lessee of a farm or a piece of land, who is not, in terms of this Ordinance, the owner of the game on such farm or piece of land;

(b) "game" shall not include exotic game.

(6) Any person who contravenes or fails to comply with any provision of subsection (1), (2) or (4) or any condition, requirement or restriction of any permission granted thereunder shall be guilty of an offence and liable on conviction to a fine not less than one hundred rand and not exceeding one thousand five hundred rand or to imprisonment for a period of not less than one month and not exceeding three years or to both such fine and such imprisonment.

(7) Any person who contravenes, or fails to comply with, the provisions of subsection (3) or who furnishes false information in respect of any provision of this section, or who makes a false entry in a document referred to in subsection (3), shall be guilty of an offence.

48. (1) No person shall transport game or game meat unless he-

(a) is the holder of a permit, written authority or written permission granted and issued in terms of this Ordinance, authorising him to hunt, capture, or keep such game, or to import such game into the Territory or to export such game from the Territory, and has such permit, written authority or written permission on his person at the time of such transport;

(b) is the holder of a game dealer's licence issued in terms of this Ordinance;

(c) is the holder of a document handed to him in accordance with the provisions of section 46 or 47 and has such document on his person at the time of such transport;

(d) has been commanded in writing by the owner or lessee of a farm or land who may lawfully donate game or game meat in terms of this Ordinance, to transport game or game meat which is so donated to another person for such other person and deliver it to him and has such command as well as the document referred to in paragraph (c) on his person at the time of such transport.

(2) The provisions of subsection (1) shall not apply to-

(a) the owner or lessee of a farm or land, who transports any game or the game meat of any game lawfully hunted or captured on such farm or land in accordance with the provisions of this Ordinance;

(b) the parent or child of any owner or lessee of a farm or land who transport the game meat of any game which such parent or child has lawfully hunted on such farm or land in accordance with the provisions of this Ordinance;

(c) the employee of any owner or lessee of a farm or land who transports the game meat of any game which such employee has lawfully hunted on such farm or land in accordance with the provisions of this Ordinance, provided such employee shall have the written permission referred to in section 31 (2) on his person at the time of such transport if he transports it on any place other than the farm or land of his employer; (A 27/86/20)

(d) any person who transports game meat other than the meat of huntable game birds, of less than ten kilograms donated to him.

(3) Any person who contravenes or fails to comply with any provision of this section, shall be guilty of an offence.

Import and export of game and wild animals and their skins.

49. (1) No person shall import into the Territory or export from the Territory any game or wild animal or the raw skin or raw meat of any game or wild animal except under a permit granted by the Cabinet: Provided that the provisions of this subsection shall not apply in respect of-

(a) the raw skin of any game or wild animal imported into the Territory from the Republic of South Africa;

b) the raw skin on any game carcass which is imported into the Territory or exported from the Territory under a permit granted in terms of this subsection or in accordance with the provisions of paragraph (c);

(c) the raw meat of any game or wild animal imported into the Territory by the person for his own consumption or which has in accordance with the provisions of this Ordinance been lawfully hunted or purchased by or donated to the person so exporting it for his own consumption; (A 27/86/21 (a))

(2) (a) The Executive Committee may at any time in its discretion, place a prohibition on the import into the Territory or the export from the Territory of the prepared or tanned skin, or any product manufactured therefrom, of any species of game or wild animal, or impose the conditions which it may in its discretion determine respect of the import into the Territory or the export from the Territory of any such skin or product.

(b) Any prohibition or condition imposed under paragraph (a) shall be made known by notice in the *Official Gazette*.

(3) A permit referred to in subsection (1) shall be granted upon payment of the fees (if any) determined by the Cabinet: Provided that the Cabinet may, if it is satisfied that the game, wild animal raw skin or raw meat to which such permit has a bearing, is destined for or required by a public museum, zoological garden or scientific institution, or for scientific purposes and that no profit will be derived therefrom, in its discretion, reduce such fees or exempt the person to whom the permit is granted from the payment of such fees. (A27/86/21(b).A17/88)

(4) Any person who contravenes or fails to comply with any provision of this section, or any condition, requirement or restriction of any permit granted thereunder or a prohibition or condition imposed under this section, shall be guilty of an offence.

Prohibition of the removal of game found dead.

50. (1) Subject to the provisions of subsection (2) no person other than the owner or lessee of land on which any game is found dead shall remove such game or any part thereof from the place where it is found dead, unless it was killed in accordance with the provisions of this Ordinance by the person removing it.

(2) Any game found dead or any part thereof may-

(a) if it is found-

(i) on a proclaimed road,

(ii) within the boundaries of the road reserve of a proclaimed road and constitutes a danger to traffic on such proclaimed road,
be removed by any person from the place where it is so found to the boundary of the said road reserve which is nearest to the place where it is so found;

(b) if it obstructs any route other than a proclaimed road, be removed by any person as far as is necessary to open the route which is so obstructed.

(3) Any person who, in accordance with the provisions of subsection (1) or (2), removes any specially protected game or protected game which is found dead, from the place where it is found dead, shall report such removal to the Director in writing within ten days thereafter.

(4) Any person who contravenes or fails to comply with any provision of this section, shall be guilty of an offence.

50A. No Person shall be in possession of any raw skin of specially protected or protected game unless he is the lawful holder of-

(a) a permit granted by the Executive Committee under section 26, 27 or 36 authorising him to hunt such specially protected or protected game; or

(b) a permit granted by the Executive Committee authorising him to be in possession of such skin.
(section 2 Ord 4/77)

Inability to give satisfactory account of possession.

51. Any person found in possession of any game or wild animal or any game meat or the egg of any game or a wild animal in respect of which a reasonable suspicion exists that it has been hunted or obtained or is possessed contrary to the provision of this Ordinance, and who is unable to prove that he has hunted or acquired or possesses such game or wild animal or game meat or egg lawfully in accordance with the provisions of this Ordinance, shall be guilty of an offence.

CHAPTER IV.

PROBLEM ANIMALS.

Application of Chapter.

52. No provision of this Chapter shall be applicable within a game park: Provided that the Executive Committee may in its discretion declare that any one or more of the provisions of this Chapter shall be applicable within any game park, or any part of a game park, designated by it.

Declaration as problem animal.

53. (1) The Executive Committee may declare any wild animal a problem animal throughout the Territory or within such part or parts of the Territory as it may in its discretion determine.

(2) Whenever the Executive Committee declares any wild animal a problem animal in terms of the provisions of subsection (1), the name of such wild animal and a definition of the part or parts of the Territory within which such wild animal is declared a problem animal shall be made known by notice in the Official Gazette.

Hunting of problem animals.

54. (1) Notwithstanding anything to the contrary in this Ordinance contained but subject to the provisions of this Chapter, the owner or lessee of land may-

(a) at any time hunt any problem animal found on such land;

(b) engage or request any other person at any time to hunt, or assist in the hunting of, any problem animal found on such land as long as such problem animal is on such land.

(2) Notwithstanding anything to the contrary in this Ordinance contained, any nature conservator, or any other person authorised or instructed thereto by the Executive Committee, may at any time hunt any problem animal and for that purpose such nature conservator or other person may enter upon any land

without the consent of the owner or lessee thereof: Provided that whenever possible notice of such person's presence on such land shall be given to the occupier thereof or any other person apparently in charge thereof.

Compulsory control of black-backed jackal.

55. (1) (a) Whenever black-backed jackal are found in such large numbers on any land situated in the small stock area that, in the opinion of the Executive Committee, they constitute a nuisance or may possibly cause damage on any adjoining land which is also situated in the small stock area, the Executive Committee may, in writing, order the owner or lessee of the land on which the said black-backed jackal are so found, to exterminate the said black-backed jackal on such land, or to reduce their numbers to the satisfaction of the Executive Committee within a period specified by the Executive Committee.

(b) For the purposes of paragraph (a) "small stock area" means the whole of the Territory excluding that part of the Territory which is situated to the north of the twenty-third degree of latitude and to the east of the sixteenth degree of longitude.

(2) An order referred to in subsection (1) shall be deemed to have been served on the owner or lessee of any land -

(a) if delivered to him;

(b) if left in the care of an adult person who apparently inhabits or occupies his last-known dwelling place or such land, or who is employed there;

(c) if sent to his last-known postal address by registered post.

(3) If any owner or lessee of land on whom an order referred to in subsection (1) has been served, fails to exterminate the black-backed jackal occurring on such land, or to reduce their numbers to the satisfaction of the Executive Committee, within the period stipulated by the Executive Committee, or any extension of such period which the Executive Committee may in its discretion allow, the Executive Committee may cause the said black-backed jackal to be hunted by any nature conservator or any other person authorised or instructed thereto by the Executive Committee, and for that purpose such nature conservator Or other person may enter upon such land without the consent of the owner or lessee thereof: Provided that whenever possible, notice of such person's presence on such land shall be given to the occupier thereof or any other person apparently in charge thereof.

(4) The owner or lessee of any land on which black-backed jackal are killed in terms of the provisions of subsection (3) shall-

(a) if the land on which the black-backed jack are so killed is situated within an area in respect of which contributions towards the cost of jackal-proof fencing have been declared obligatory in terms of the Fencing Proclamation Amendment Ordinance 1957 (Ordinance 6 of 1957), pay an amount of two hundred rand; or

(b) if the land on which the black-backed jackal are so killed is not situated within an area in respect of which contributions towards the cost of jackal-proof fencing have been declared obligatory in terms of the Fencing Proclamation Amendment Ordinance 195 (Ordinance 6 of 1957), pay an amount fifty rand, to the State in respect of every black-backed jackal killed on such land in terms of the provisions of subsection (3). (A27/86/22(a))

(5) An amount payable to the State in terms of subsection (4) shall be deemed to be a debt due to the State and may be recovered from the person by whom it has to be paid in terms of the said subsection in any competent court. (A27/86/22(b))

Provision of aids.

56. The Executive Committee may on the conditions and at the prices determined by it provide any person, authorised by or in terms of this Chapter to hunt problem animals, with any apparatus and aids (including poison) which can be applied for or in connection with the hunting of problem animals.

Training of hunters.

57. (1) The Executive Committee may train nature conservators and other persons or cause them to be trained to hunt problem animals and to use any apparatus or aid which can be applied for or in connection

with the hunting of problem animals and may for that purpose present any courses or cause any courses to be presented, on such conditions (including the payment of fees) as it may determine.

(2) Notwithstanding the provisions of section 59 the Executive Committee may supply any apparatus and aids needed at the presentation of any course referred to in subsection (1).

(3) The Director shall issue every person who has Completed a course in the use, placing and setting of the coyote getter, jackal cannon or gun trap and who is, to his satisfaction, competent to use, to place and to set a coyote getter, jackal cannon or gun trap, with a certificate of competency authorising him to use, to place and to set a coyote getter, jackal cannon or gun trap subject to the conditions mentioned in such certificate: Provided that the Director may issue any person who has not completed a course in the use, placing and setting of the jackal cannon or gun trap with a certificate of competency authorising him to use, to place and to set a jackal cannon or gun trap subject to the conditions mentioned in such certificate if such person proves to the satisfaction of the Director that he is competent to use, to place and to set a jackal cannon or gun trap.

Trade in coyote getters.

58. (1) No person shall, without the written permission of the Executive Committee, import into the Territory, manufacture, sell or offer or possess for sale any coyote getter or cartridges therefor.

(2). Any person to whom permission has been granted in terms of subsection (1) to import into the Territory, manufacture, sell or offer or possess for sale coyote getters or cartridges therefor, shall keep the register prescribed by regulation.

(3). Any person who contravenes or fails to comply with any provision of this section or any condition, requirement or restriction of any permission referred to in subsection (1), shall be guilty of an offence and liable on conviction to a fine not exceeding five hundred rand or to imprisonment for a period not exceeding six months or to both such fine and such imprisonment.

Prohibition of the supply of coyote getters to incompetent persons.

59. (1) Subject to the provisions of section 57, no person shall sell, donate or in any other manner whatsoever supply a coyote getter or cartridges therefor to any other person unless such other person-

(a) is the holder of a certificate of competency; and

(b) produces such certificate of competency to him at the time of such sale, donation or supply.

(2). Any person who sells, donates or supplies a coyote getter or cartridges therefor to any other person contrary to the provisions of subsection (1) shall be guilty of an offence and liable on conviction to a fine not exceeding five hundred rand or to imprisonment for a period not exceeding six months or to both such fine and such imprisonment.

Prohibition of the obtaining of coyote getter by incompetent persons.

60. (1) Subject to the provisions of section 58, no person shall-

(a) purchase, receive or in any other manner whatsoever acquire or obtain a coyote getter or cartridges therefor;

(b) have a coyote getter or cartridges therefor in his possession unless he is the holder of a certificate of competency.

(2) Any person who purchases, receives, acquires, obtains or possesses a coyote getter or cartridges therefor contrary to the provisions of subsection (1) shall be guilty of an offence and liable on conviction to a fine not exceeding five hundred rand or to imprisonment for a period not exceeding six months or to both such fine and such imprisonment.

Use of poison and coyote getters.

61. (1) Subject to any provisions to the contrary in any law contained, no person shall set or lay any poison other than poison approved by the Executive Committee on any land.

(2) No person shall-

(a) use, set or place a coyote getter, jackal cannon or gun trap-

(i) except under the authority of and in accordance with the conditions of a certificate of competency issued to him; and

(ii) unless warning sign boards of a design and with the wording approved by the Director have previously been erected at all entrances to the land on which such coyote getter, jackal cannon or gun trap is set or placed or is to be set or placed;

(b) set or place a coyote getter jackal cannon or gun trap-

(i) between any fence erected nearer than two hundred metres to the centre line of a proclaimed road, and such road;

(ii) at any place nearer than two hundred metres to the centre line of a proclaimed road, unless there is a fence between the place where the said coyote getter, jackal cannon or gun trap has been set or placed, and such road;

(c) use any poison which has not been approved by the Executive Committee in a coyote getter.

(3) Any person who contravenes or fails to comply with any provision of subsection (i) or (2) shall be guilty of an offence and liable on conviction to a fine not exceeding five hundred rand or to imprisonment for a period of not exceeding six months or to both such fine and such imprisonment.

Research in regard to problem animals.

62. (1) The Executive Committee may instruct any nature conservator or other officer and authorise any other person to do research in connection with the control of problem animals subject to the conditions determined by it.

(2) Any person instructed or authorised in terms of subsection (1) to do research in connection with the control of problem animals may, notwithstanding anything to the contrary in this Ordinance contained, but subject to the provisions of this Chapter and the conditions imposed by the Executive Committee, hunt any problem animals or capture or kill any problem animals by any chemical, mechanical and biological means.

(3) In the exercise of the powers or the performance of the functions or duties granted to or imposed on him by or in terms of this section, any person may, subject to the conditions determined by the Executive Committee, enter upon any land without the consent of the owner or lessee thereof: Provided that whenever possible notice of such person's presence on such land shall be given to the occupier thereof or any other person apparently in charge thereof..

Obstruction of persons in the performance of their duties.

63. Any person who-

(a) hinders, impedes or obstructs a nature conservator or the owner or lessee of land or any other officer or person in the exercise of the powers or the performance of the functions or duties granted to or imposed on him by or in terms of this Chapter;

(b) injures or kills a dog, horse or any other animal lawfully used in the course of or in connection with the hunting of problem animals in terms of this Chapter;

(c) damages, destroys or disfigures any apparatus, device or other property used in the course of or in connection with the hunting of problem animals in terms of this Chapter;

(d) is the owner or lessee of land and fails to render any reasonable assistance requested from him by a nature conservator or other officer acting in the exercise of any power or the performance of any function or duty in accordance with or in terms of the provisions of this Chapter,

shall be guilty of an offence.

Limitations in relation to damages.

64. If any person sustains damages as a result of the exercise or performance by a nature conservator or any other person of any power, function or duty granted to or imposed on such nature conservator or other person by or in terms of this Chapter, no person shall be compelled to compensate the damages concerned unless the person claiming the damages proves that the damages concerned was wantonly or negligently caused by such nature conservator or other person.

CHAPTER V.
FISH IN INLAND WATERS.

Definition of boundaries of lagoons.

65. (1) The Executive Committee may from time to time define the boundaries of any lagoon with reference to physical characteristics, whether natural or artificial.

(2) Any definition of the boundaries of a lagoon in terms of the provisions of subsection (1) shall be made known by notice in the *Official Gazette*.

Keeping of fish.

66. No person shall, without the written permission of the Executive Committee, place or release any fish in inland waters (excluding aquariums, and ornamental dams).
Angling under permit

67. (1) No person other than the holder of a permit granted by the Cabinet shall angle in any inland waters: Provided that-

(a) the owner or lessee of land, or the parents or children of such owner or lessee, or any person permanently employed by him and resident on such land, may angle in waters situated on such land; and

(b) any member of a particular population group may angle in waters situated on the communal land of the population group concerned,

without such permit.

(2) Any person who angles in inland waters under any permit granted in terms of this section shall at all times have such permit in his possession while he is so angling. (A27/86/23)

Manner of angling permissible.

68. (1) Subject to the provisions of subsections (3) and (4), no person shall, without the written permission of the Cabinet, catch fish in inland waters in any other manner than with a line and fish-hook: Provided that a set line shall for the purposes of this section be deemed not to be a line. (A 27/86/24)

(2) No person shall use more than two lines at the same time when angling in inland waters.

(3) No person shall-

(a) use an other fish-hook than a single fishhook when angling in inland waters;

(b) use more than two single fish-hooks on any line when angling in inland waters:

Provided that one artificial spoon, artificial fly or other artificial lure approved by the Cabinet be used instead of one single fish-hook.

(4) The provisions of this section shall not apply to any member of a particular population group who catches fish in inland waters situated on the communal land of the population group concerned. (A27/86/24)

Executive Committees may prohibit or restrict angling.

69. (1) The Executive Committee may at any time prohibit or restrict the angling of fish in general or the angling of any species of fish determined by it in any inland waters or in those inland waters determined by it on the conditions and for the period which it may deem necessary.

(2) Any prohibition or restriction imposed by the Executive Committee in terms of this section shall be made known by notice in the *Official Gazette*.

(3) Any person who contravenes or fails to comply with any provision or condition of any prohibition or restriction imposed in terms of this section shall be guilty of an offence.

Prohibition in regard to certain materials.

70. No person shall place in, or cause or allow to be dropped into, any inland waters in which fish are or might presumably be present any explosive, poisonous or intoxicating materials.

Offences.

71. Any person who contravenes or fails to comply with any provision of this Chapter, or any condition, requirement or restriction of any permit or permission granted thereunder, shall be guilty of an offence.

**CHAPTER VI.
INDIGENOUS PLANTS.**

Powers of Executive Committee in regard to indigenous plants.

72. (1) (a) The Executive Committee may from time to time amend Schedule 9 by deleting therefrom or adding thereto the name of any species of indigenous plant.

(b) Any such amendment of Schedule 9 shall be made known by notice in the *Official Gazette*.

(2) (a) The Executive Committee may from time to time exempt any species of indigenous plant in any area determined by it, from any or all of the provisions of this Ordinance.

(b) Whenever the Executive Committee has in terms of paragraph (a) exempted any species of indigenous plant from any provision or provisions of this Ordinance, the name of that species of indigenous plant, the provision or provisions of this Ordinance from which it has been so exempted, and a definition of the area in which it has been so exempted shall be made known by notice in the *Official Gazette*.

Picking and transport of protected plants.

73. (1) No person other than the lawful holder of a permit granted by the Executive Committee shall at any time pick or transport any protected plant: Provided that -

(a) the owner a nursery licensed under section 75 may without such permit pick and transport any protected plant cultivated on the premises of such nursery and cause such protected plant to be picked and transported;

(b) the owner or lessee of land may on that land without such permit pick the flower of a protected plant for use as a decoration in his home;

(c) the owner or lessee of land may without such permit pick a protected plant on that portion of such land-

(i) which he needs for cultivated lands, the erection of a building, the construction of a road or airfield or any other development which necessitates the removal of vegetation; or

(ii) on which such protected plant has been specially cultivated.

(2) Any person who contravenes or fails to comply with any provision of subsection (1) or any condition, requirement or restriction of a permit granted thereunder shall be guilty of an offence and liable on conviction to a fine not less than one hundred rand and not exceeding seven hundred and fifty rand or to imprisonment for a period of not less than one month and not exceeding twelve months or to both such fine and such imprisonment.

Sale, donation, export and removal of protected plants.

74. (1) No person other than the lawful holder of a permit granted by the Executive Committee shall sell, donate or export or remove from the Territory, any protected plant: Provided that the owner of a nursery licensed under section 75 may without such permit sell or donate and export and remove from the Territory and protected plant cultivated on the premises of such nursery

(2) Any person who contravenes or fails to comply with any provision of subsection (1) or any condition, requirement or restriction of a permit granted thereunder shall be guilty of an offence.
Exemption to owner of nursery

75. (1) Any person desiring to obtain a nursery licence shall apply therefor in writing to the Executive Committee.

(2) A nursery licence -

(a) shall be valid for the period from the first day of April of any year or, if it is issued after that day, from the day of issue, up to and including the thirty- first day of March following that day;

(b) he may be renewed annually by applying to the Director in writing for such renewal not less than six months before the expiry of the period of validity of the licence concerned; and

(c) shall not be transferable.

(3) An amount of fifty rand shall be payable at the issue and at the renewal of a nursery licence. Receipt of protected plants.

76. (1) Subject to any provisions to the contrary in this Ordinance contained, no person shall purchase a protected plant, or in any manner whatsoever come into possession thereof, or offer to purchase it or to come into possession thereof, except from a person who may lawfully sell it in terms of this Ordinance.

(2) Any person who contravenes or fails to comply with the provisions of subsection (1), shall be guilty of an offence.

Picking and transport of indigenous plants.

77. (1) Subject to any provisions to the contrary in this Ordinance contained, no person shall pick any indigenous plant on land of which he is not the owner or lessee, unless he has the written permission thereto from the owner or lessee of the land.

(2) Any person who picks any indigenous plant under a written permission granted in terms of this section, shall at all times have such written permission in his possession while he is engaged in picking or transporting such indigenous plant.

(3) The provisions of this section shall not apply to the parent, spouse or child of or white employee permanently employed by the owner or lessee of land on which indigenous plants are being picked.

(4) Any person who contravenes or fails to comply with any provision of this section, shall be guilty of an offence.

CHAPTER VII.

GENERAL.

General powers of Executive Committee.

78. The Executive Committee may -

(a) provide for the acquisition or lease of movable or immovable property, servitudes or other rights thereon, for -

(i) the establishment, erection, extension or improvement of game parks, fisheries and nurseries;

(ii) the preservation of nature or any part of nature;

(b) take the measures which it may deem necessary or desirable in connection with the propagation and preservation of wild animals, exotic game, fish and plants;

(c) take the measures which it may deem necessary or desirable for the destruction, decrease or elimination, whether in general or in any particular area, of any problem animal or any other species of wild animal, exotic game, fish or plant, which may be harmful or detrimental to the existence of any other species of wild animal, fish or indigenous plant or which, in its opinion, may present a threat from the point of view of farming or stock diseases;

(d) take the measures which it may deem necessary or desirable for the import or transfer from one area to another of wild animals, exotic game, fish and plants and the acclimatisation of such wild animals, exotic game, fish and plants in the area to which they have so been imported or transferred;

(e) take the measures which it may deem necessary or desirable for the capture of wild animals or exotic game, the catching of fish or the collection of plants;

(f) take the measures which it may deem necessary or desirable for the purchase and sale of wild animals, exotic game, fish and plants, whether alive or dead;

(g) take any measures whatsoever which it may deem necessary or desirable for research in connection with wild animals, exotic game, fisheries and plants;

(h) take the measures which it may deem necessary or desirable for the making of surveys and the conduction of investigation in connecting with wild animals, exotic game, fish and plants;

(i) take the measures which it may deem necessary or desirable for the collection and publication of statistics and information in connection with nature conservation;

(j) take the measures which it may deem necessary or desirable for the control of aquatic vegetation in waters;

(k) render any assistance, whether financial or otherwise, to anybody, society or person which or who in its opinion promotes the preservation of wild animals, fish, indigenous plants or nature in general;

(kA) take the measures which it may deem necessary or desirable for the payment of monetary rewards to persons furnishing information in connection with contraventions of the provisions of this Ordinance. (A 27/86/25)

(l) take the measures which it may deem necessary or desirable for the better carrying out of the provisions or purposes of this Ordinance in general without limitation of the generality thereof by matters mentioned specifically in this section.

Appointment of nature conservators and honorary nature conservators.

79. (1) The Cabinet may, subject to the provisions of the Government Service Act, 1980 (Act 2 of 1980), appoint the persons whom it may deem necessary and suitable, as nature conservators for the whole of the Territory, or for a part of the Territory or for magisterial district. (A 27/86/26 (a))

(2) (a) The Executive Committee may appoint one or more persons whom it may deem suitable as honorary nature conservators for the whole of the Territory or for a part of the Territory or for a magisterial district for a period not exceeding three years at a time: Provided that the Executive Committee may in its discretion appoint any person as honorary nature conservator for life.

(b) The Executive Committee may at any time withdraw the appointment of a person as an honorary nature conservator and appoint any other person whom it may deem suitable as honorary nature conservator in the place of such person.

(3) Any person who is a member of the board shall be an honorary nature conservator for as long as he holds such office.(4) Deleted A 27/86/26 (b)

Certificate of appointment.

80. Every nature conservator, except a member of the security forces, and every honorary nature conservator shall be furnished by the Director with a certificate of appointment and a badge and shall when exercising any power or performing any function or duty in terms of this Ordinance, produce such certificate for inspection if requested to do so.(A 27/86/27)

Powers, functions and duties of nature conservators and honorary nature conservators.

81. (1) A nature conservator may exercise and perform and all those powers, duties and functions granted to or imposed on him by or in terms of this Ordinance and may, in addition thereto -

(a) at any time conduct any investigation which he deems necessary in order to determine whether the provisions of this Ordinance are being complied with;

(b) at any time without warrant and without permission enter upon any land, premises, waters, building, tent, camping or other place, vehicle, vessel, boat, raft, aircraft or other means of conveyance and there conduct the investigation and inspection (including an investigation and inspection of any container or other thing found thereon or therein) which he deems necessary in order to determine whether the provisions of this Ordinance are being complied with;

(c) at any time without warrant and without permission enter upon any land, premises, waters, building, tent, camping or other place, vehicle, vessel, boat, raft, aircraft or other means of conveyance or container of whatever description, and there conduct a search if he reasonably suspects that there is anything thereon or therein which -

- (i) is being used or has been used for the purpose of or in or in connection with;
- (ii) in his opinion forms or has formed an element in;
- (iii) in his opinion will, or may furnish proof of the commission of an offence in terms of this Ordinance;

(d) at any time in the course of any investigation or inspection which he conducts or intends conducting in terms of this Ordinance, without warrant and without permission demand that any vehicle, vessel, boat, raft, aircraft or other means of conveyance be brought to a standstill and remain stationary until he has completed his investigation or inspection and has given permission that it may depart or continue its journey;

(e) at any time without warrant seize anything

- (i) in respect of which he reasonably suspects that it is being used or has been used for the purpose of or in or in connection with;
- (ii) in his opinion forms or has formed an element in;
- (iii) in his opinion will or may furnish proof of the commission of an offence in terms of this Ordinance;

(f) at any time question any person who in his opinion may possibly be able to furnish any information which he requires in connection with the enforcement of any provision of this Ordinance, and for that purpose, without warrant and without permission demand that any vehicle, vessel, boat, raft, aircraft or other means of conveyance be brought to a standstill and remain stationary until he has completed his questioning and has given permission that it may depart or continue its journey;

(g) at any time order any person who in his opinion may possible have information which is material in connection with a contravention of this Ordinance, to furnish him with such information as such person may be able to give;

(h) demand the name and address of any person -

- (i) who has committed an offence in terms of this Ordinance, or who is reasonably suspected of having committed such an offence;
- (ii) who is reasonably considered to be able to give evidence in connection with an offence committed in terms of this Ordinance, or is reasonably suspected of having been so committed;

(i) remove any snare, trap, springtrap, pitfall, holding pen, trap-cage, net, birdlime, fishtrap, set line, fishing tackle, gun trap, jackal cannon or coyote getter or cartridges therefor, poison or any other like article, means or contrivance which is being used or which is suspected of being used unlawfully to hunt or catch game or any wild animal or fish, from the place where it is found, or if such removal is impossible or dangerous or difficult, destroy or render it harmless;

(j) at any time demand from any person who performs or has performed an act, or in respect of whom it is reasonably suspected that he is performing or has performed an act, for which a licence, permit, exemption, written authority or permission or any other document is necessary in terms of this Ordinance, that he shall produce, such licence, permit, exemption, written authority or permission or other document;

(k) at any time demand from any person who is required in terms of this Ordinance to keep a register, to produce such register, and inspect such register;

(l) without warrant seize and confiscate any game, wild animal, fish or plant which is found in possession of, or held in captivity by any person if -

- (i) such person fails, at the demand of such nature conservator, to produce a permit, licence, exemption, written authority or permission or any other document authorising such possession or captivity;
- (ii) such game, wild animal, fish or plant is in possession of or is being kept in captivity by such person contrary to any condition specified in a permit, licence, exemption, written authority or permission or any other document produced by such person authorising such possession or keeping;

(m) having been instructed thereto by the Executive Committee, and with or without the permission of the owner or lessee of the land on which it is found, capture and transport to a game park any game or other wild animal which, owing to its scarcity, runs the risk of being exterminated;

(n) having been instructed thereto by the Executive Committee, and with the permission of the owner or lessee of the land concerned, capture or destroy on such land any game or wild animal -

(i) destroying or damaging crops or plants on cultivated lands, or cultivated trees on such land;

(ii) found in such numbers on such land that, in the opinion of the Executive Committee, they will damage or may probably damage the grazing on such land;

(iii) which is or may possibly be a danger to human beings;

(o) whenever it is necessary for the proper exercise of his powers, or for the proper performance of his functions or duties, and whether for scientific or any other purposes.

(i) hunt, capture or keep any game or other wild animal;

(ii) catch any fish irrespective of the species or size thereof;

(iii) pick any indigenous or protected plant

on any land or in an inland waters owned by the Government of the Territory or a representative authority and, with the permission of the owner or lessee thereof, also on land not owned by the Government of the Territory or a representative authority: Provided that, for the purposes of this paragraph, "lessee" shall not include the lessee of land who is not the owner of the huntable game, huntable game birds and exotic game on such land; (A27/86/28(a))

(p) if it is necessary for the exercise of his powers or the performance of his functions or duties, or if he deems it necessary therefor carry a fire-arm on his person even if he is on land which is not owned by the Government of the Territory or a representative authority; (A27/86/28)

(q) for the better exercise of any power or the better performance of any function or duty, take with him an interpreter or an assistant who shall be an officer, and such interpreter or assistant shall, while acting under the lawful command and supervision of: such nature conservator, have the same powers, duties and functions as such nature conservator.

(2) In so far as offences in terms of this Ordinance are concerned, every nature conservator shall have all the powers of a peace officer to arrest any person without warrant which peace officers have under section 22 of the Criminal Procedure Ordinance. 1963 (Ordinance 34 of 1963).

(3) When a nature conservator who has under subsection (2) been authorised to arrest any person who has contravened any provision of Chapter II or who, on reasonable grounds is suspected of the contravention thereof, attempts to arrest such person and that person flees or offers resistance and can not be arrested and prevented from escaping in any other manner than by killing the person so fleeing or offering resistance, such homicide shall legally be held to held justifiable homicide.

(4) An honorary nature conservator shall have the power granted to a nature conservator by subsection (1) (a), and shall in addition thereto -(A27/86/28(c))

(a) at the request of the Director, in the manner and at the times determined by the Director, or at any time of his own accord, report to the Director in relation to malconditions, malpractices, abuses and other matters in connection with the protection of game, other wild animals, fish and indigenous and protected plants in the area for which he has been appointed; (A27/86/28(d))

(b) as soon as possible after it has come to his notice report or cause to be reported, to the nearest nature conservator any offence in terms of this Ordinance or any other law relating to the conservation of game, wild animals or nature in force in the area for which has has been appointed;

(c) at least once per year, at the time and place and in the manner determined by the Director, report to the Director in connection with the game, wild animals, fish and: indigenous and protected plants in his area and in such report provide information in relation to -(A27/86/28(e))

(i) any noticeable decrease or increase in the numbers of any particular species of game or wild animal, and the possible or probable reasons for such decrease or increase;

(ii) prominent movements of game or wild animals such as migration from one farm or area to another, and the possible or probable reasons therefor;

(iii) epidemics or diseases occurring amongst game, wild animals, fish or indigenous or protected plants:

(iv) particular difficulties caused by game or wild animals;

- (v) comments on the hunting, capturing and keeping of game, the catching of fish and the picking of indigenous and protected plants in his area or any part thereof;
- (vi) proposals in connection with the hunting regulations for the next hunting season;
- (vii) proposals in connection with the amendment of this Ordinance or any regulations made and in force thereunder or any other law containing provisions relating to nature or game conservation and which is in force in his area;
- (viii) comments on the control and development of game parks;
- (ix) comments on any matter relating to nature conservation.

(5) Any person who assaults or resists or hinders or impedes a nature conservator, an honorary nature conservator or the assistant or interpreter of a nature conservator in the exercise of his powers or the performance of his functions or duties, or wilfully interferes with such nature conservator, honorary nature conservator, assistant or interpreter, shall be guilty of an offence and liable on conviction to a fine not exceeding R 4000 or to imprisonment for a period not exceeding four years, or to both such fine and such imprisonment. (A27/86/28(f))

(6) A person who -

(a) falsely pretends to be a nature conservator or the assistant or interpreter of a nature conservator or an honorary nature conservator.

(b) refuses or fails to comply forthwith with any order, direction, requirement or request given or put to him by a nature conservator, an honorary nature conservator or the assistant or interpreter of a nature conservator in the exercise of any power or the performance of any function or duty in terms of this Ordinance, or who furnishes untrue or misleading information when complying with such order, direction, requirement or request,

shall be guilty of an offence.

81.A (1) A nature conservator who seizes anything (hereinafter referred to as an article) under this Ordinance -

(a) may, if the article is a perishable, with due regard to the interests of the persons concerned, dispose of the article in such manner as the circumstances may require;

(b) shall, if the article is not disposed of in terms of the provisions of paragraph (a), give it a distinctive identification mark and deliver it to a policeman, who shall retain it in police custody or make such other arrangements with regard to the custody thereof as the circumstances may, whereupon the provisions of sections 50D, 50E, 50F and 50G of the Criminal Procedure Ordinance, 1963 (Ordinance 34 of 1963), shall apply mutatis mutandis with reference to any such article and such article shall for the purposes of the said sections be deemed to be an article referred to in section 50C (c) of the said Ordinance: Provided that any such article which may be forfeited in terms of any of the said sections, shall be forfeited for the State.

(2) Any article so forfeited may be disposed to the State may be disposed of by the Cabinet and the proceeds obtained therefrom shall be paid into the Central Revenue Fund. (A27/86/29,)[Ord 4/77]

Exemptions.

82. The Executive Committee may, if it is of the opinion that it is or will be in the interests of nature conservation, exempt any person from any or all of the provisions of this Ordinance.

Conditions in relation to permits, licences, registrations, approvals, permission and exemptions.

83. (1) No person shall be entitled to claim that he has a right to obtain any permit, licence, registration, approval, permission or exemption which is required or may be issued or granted in terms of this Ordinance and the Executive Committee shall not be obliged to furnish any reasons for the refusal by it to grant or issue any such permit, licence, registration, approval, permission or exemption.

(2) (a) Every permit, licence, registration, approval, permission or exemption granted by the Cabinet in terms of this Ordinance shall be issued against payment of the fees, if any prescribed for such permit, licence, registration, approval, permission or exemption by this Ordinance or a, subject to the provisions of paragraph (b), by regulation: Provided that the Cabinet may, subject to the provisions of this

Ordinance, decrease such fees or grant exemption from the payment of such fees if it is of the opinion that good and sufficient reason therefor exists. ([A27/86/30(a)])

(b) Fees prescribed by regulation under paragraph (a) for a permit or permission in relation to the hunting of game or other wild animals on communal land of a particular population group or on land owned by a representative authority, shall be so prescribed only with the concurrence of the executive authority of the population group concerned and no decrease of such fees or exemption from the payment thereof shall be allowed or granted by the Cabinet under paragraph (a) unless the executive authority concerned has concurred to such decrease or exemption.

(3) (a) Every permit, licence, registration, approval, permission or exemption granted by the Cabinet in terms of this Ordinance shall be subject to the conditions, requirements and restrictions prescribed, subject to the provisions of paragraph (b) by regulation, whether in general or for the particular permit, licence, registration, approval, permission or exemption and, in addition thereto, to the conditions, requirements and restrictions which the Cabinet may, subject to the provisions of paragraph (b), in every particular case deem necessary or expedient to impose. (A27/86/30(b))

(b) Any conditions, requirements and restrictions which are prescribed or imposed under paragraph (a) for a permit or permission in relation to the hunting of game or other wild animals on communal land of a particular population group or on land owned by a representative authority shall be so prescribed or imposed only with the concurrence of the executive authority of the population group concerned. (A.27/86/30(b))

(4) Every permit, licence, registration, approval, permission or exemption granted by the Executive Committee in terms of this Ordinance shall, subject to the provisions of this Ordinance, be valid for the period determined by the Executive Committee.

(5) (a) The Cabinet may subject to the provisions of paragraph (e), at any time, without furnishing any reasons therefore-(A27/86/30(c))

(i) withdraw any permit, licence, registration, approval, permission or exemption granted by it in terms of this Ordinance;

(ii) amend, change or withdraw the conditions, requirements and restrictions to which a permit, licence, registration, approval, permission or exemption so granted by it is subject;

(iii) add any further conditions, requirements and restrictions to the conditions, requirement and restrictions to which such permit, licence, registration, approval, permission or exemption is subject.

(b) Whenever the Executive Committee exercises any of the powers granted to it by paragraph (a), it shall inform the holder of the permit, licence, registration, approval, permission or exemption concerned thereof and such holder shall forthwith return such permit, licence, registration, approval, permission or exemption to the Director.

(c) Any person who refuses or fails so to return such permit, licence, registration, approval, permission or exemption shall be guilty of an offence.

(d) If any person suffers damages as a result of the exercise by the Cabinet of any of the powers granted to it by this subsection, the State shall not be obliged to pay any compensation to such person for any damages which he suffered as a result of the exercise of the power concerned.

(e) No condition, requirement or restriction to which a permit or permission for the hunting of game or other wild animals on communal land of a particular population group or on land owned by a representative authority is subject, shall be amended, changed or withdrawn by the Cabinet and no further condition, requirement or restriction shall be added by the Cabinet to the conditions, requirements or restrictions to which such a permit or permission is subject, unless the executive authority of the population group concerned has concurred to such amendment, change, withdrawal or addition. (A27/86/30(d)) (A.27/86/30(e))

(6) (a) Any permit, licence, registration, approval, permission or exemption issued or granted contrary to the provisions of this Ordinance shall be invalid, and the holder of any such permit, licence, registration, approval, permission or exemption or any other person who is in possession thereof shall, at the request of the Executive Committee, forthwith return such permit, licence, registration, approval, permission or exemption to the Director.

(b) Any person who contravenes or refuses or fails to comply with the provisions of paragraph (a) shall be guilty of an offence.

(7) All moneys collected and received in respect of permits or permissions issued in terms of this Ordinance for the hunting of game or other wild animals on communal land of a particular population group or on land owned by a representative authority, shall be paid to the revenue fund of the representative authority concerned. (A.27/86/30(f))

84. (1) The Executive Committee may make regulations in relation to -

(a) any matter which is required or permitted to be prescribed in terms of this Ordinance;

(b) (i) the conditions on which permission to enter a game park or a nature reserve or to reside therein may be granted and the periods or times during which a game park or nature reserve or any part thereof shall be open to the public;

(ii) the conditions on which any person entering, passing through or sojourning within a game park or nature reserve may obtain the services or attendance of officers and the fees to be paid for such services or attendance:

(iii) the fees, if any, to be paid for permission to enter or reside in a game park or a nature reserve, the admission of motor vehicles, aircraft, vessels or other vehicles to and the taking of photographs in a game park or a nature reserve or for any other matter connected with the use and enjoyment of a game park or a nature reserve;

(iv) the protection and preservation of a game park or a nature reserve and of the animals, fish, birds, vegetation or any other object or property therein;

(v) the regulation of traffic and the carriage of passengers in a game park or a nature reserve, the places at which persons may enter and the routes by which they may pass through a game park or a nature reserve;

(vi) generally for the efficient control and management of a game park or a nature reserve;

(c) the administration and control of private game parks and private nature reserves, the protection of wild animal life and wild vegetation therein and the requirements to be complied with before any area may be declared a private game park or a private nature reserve or before the declaration of any area as a private game park or a private nature reserve shall be withdrawn;

(d) the circumstances under which any permit, licence, registration, approval, permission or exemption shall be granted by the Executive Committee in terms of this Ordinance and the form in which any such permit, licence, registration, approval, permission or exemption shall be issued;

(e) the keeping of registers relating to the obtaining, processing, sale or export of the skins of game or wild animals by licensed game dealers, dealers dealing in skins of game or wild animals, tanneries and other persons or bodies interested in the obtaining, processing, sale or export of the skins of game or wild animals;

(f) the removal, disturbance or destruction of the eggs of any species of bird which is a wild animal or of any product or offal derived or obtained from any species of bird which is a wild animal and the levying of any royalties and moneys in connection therewith; (Ord 4/77)

(g) the keeping in captivity, transport or removal from one place to another of any game or wild animal;

(h) the requirements to be complied with by any person when he has wounded any game or wild animal;

(i) the immobilisation of game or wild animals;

(j) research in connection with problem animals and other animals which may possibly be declared problem animals;

(k) the registers to be kept by any person who imports or sells or offers for sale or is, for the purpose of selling it, in possession of coyote getters and cartridges therefor;

(l) the regulation, control and prohibition of the throwing or laying of poison;

(m) the payment of a reward for the destruction or extermination of problem animals, whether in general or in any specific area, the conditions on which such reward shall be paid and the proof to be submitted in connection with the payment of such reward;

(n) the supervision and control and the development and protection of fisheries;

(o) the dimensions, mass or size of fish which may be caught and kept and the definition and determination of measuring methods;

(p) the nature, dimensions, form and construction of fishing tackle which may be used, whether in general or in regard to any particular species of fish;

(q) the sale of cultivated indigenous plants;

(r) the control and regulation of the possession of any protected plant;

(s) the regulation of the import, cultivation and control of any plant, whether it is an indigenous plant or not, which, in the opinion of the Executive Committee, may be detrimental to, or create less favourable conditions for, any wild animal, fish or indigenous plant;

(t) the recognition and registration of succulent associations, including the requirements which shall be satisfied by a succulent association in order to be registered, the restrictions and conditions to which such registration shall be subject, the privileges to which such registration shall entitle a succulent association and the cancellation of such registration;

(u) the recognition and registration of cage-bird associations, including the requirements which shall be satisfied by a cage-bird association in order to be registered, the restrictions and conditions to which such registration shall be subject, the privileges to which such registration shall entitle a cage-bird association and the cancellation of such registration;

(v) the recognition and registration of any other association which has the protection or conservation of nature or any aspect thereof, or of any game, wild animals, fisheries or plants as its object, including the requirements which shall be satisfied by such association in order to be registered, the restrictions and conditions to which such registration shall be subject, the privileges to which such registration shall entitle such association and the cancellation of such registration;

(w) (i) control over the hunting of game for the sake of trophies;

(ii) control over advertising in relating to the hunting of game for the sake of trophies;

(iii) the periods during which and the places where game may or may not be hunted for the sake of trophies;

(iv) the registration of hunting farms, including the requirements which shall be satisfied by a farm in order to be registered as a hunting farm, the conditions and restrictions to which such registration shall be subject, the fees to be paid at such registration and the withdrawal of any such registration;

(v) control over hunting farms and the running thereof as well as control over the services rendered and facilities provided by or on hunting farms;

(vi) the registration of professional hunters, including the requirements which shall be satisfied by any person in order to be registered as a professional hunter, the conditions and restrictions to which such registration shall be subject, the fees to be paid at such registration and the withdrawal of any such registration;

(viA) the registration of master hunting guides, including the requirements which shall be satisfied by any person in order to be registered as a master hunting guide, the conditions and restrictions to which such registration shall be subject, the fees to be paid at such registration and the withdrawal of any such registration; (A.6/88/5(a),)

(vii) the registration of hunting guides including the requirements which shall be satisfied by any person in order to be registered as a hunting guide, the conditions and restrictions to which such registration shall be subject, the fees to be paid at such registration and the withdrawal of any such registration;

(viii) the training of persons as professional hunters, master hunting guides and hunting guides; (A.6/88/5(b))

(ix) the testing of any person in order to determine whether he satisfies the requirements for registration as a professional hunter master hunting guide or hunting guide;(A.6/88/5(c))

(x) the preservation of game, wild animals, fish and indigenous plants in general or any species of game, wild animal, fish or Indigenous plant;

(y) generally any matter which the Executive Committee may deem necessary or desirable to prescribe in order to achieve the aims and objects of this Ordinance and to ensure the effective execution of the provisions thereof.

(2) Different regulations may be made in terms of subsection (1) (b) in relation to different game parks or nature reserves.

(3) The power to make regulations in relation to any matter mentioned in subsection (1) shall include the power to prohibit anything, either absolutely or conditionally, in connection with that matter.

(4) All regulations made in terms of this section shall, subject to the provisions of this Ordinance be applicable in general and throughout the Territory: Provided that the Executive Committee may determine that any regulations so made shall be applicable only to that game, wild animal, fish or indigenous plant or exotic plant or to that part of the Territory which it determines and which is made known by notice in the *Official Gazette*.

(5) Any person who contravenes or fails to comply with the provisions of any regulation made in terms of this section shall be guilty of an offence.

Presumptions.

85. (1) Whenever in any prosecution against any person upon a charge alleging that he committed upon any particular piece of land an offence in terms of the provisions of this Ordinance, it is proved that any act, forming part of such offence, was committed in or near the locality wherein such piece of land is situated, such act shall be deemed to have been committed on such piece of land, unless it is proved-

(a) that it was committed on another piece of land; and

(b) that the person who committed such act had the right to commit it on such other piece of land.

(2) Whenever any person performs an act and he would commit or have committed an offence by performing that act if he had not been the holder of a licence, registration, permit, exemption, document, written per-mission or written or other authority or power (hereinafter in this section called the necessary authority) to perform such act, he shall, if charged with the commission of such offence, be deemed not to have been the holder of the necessary authority, unless the contrary is proved.

(3) In any prosecution for an offence in terms of the provisions of this Ordinance in connection with the unlawful keeping in captivity of any live wild animal or exotic game, any person against whom it is proved that he possesses or has possessed a live animal or exotic game, shall be deemed to keep in captivity or to have kept in captivity such wild animal or exotic game, unless the contrary is proved.(A27.86/31.)

(3A) Whenever in any prosecution for an offence in terms of the provisions of section 40A it is proved that a person has removed, damaged, cut, flattened or raised any game-proof fence or adequate fence between any farm or piece of land and other farm or piece of land of which he is not the owner or lessee or that he has constructed a game-trap in such a fence or allow a game-trap to exist therein it shall be deemed, unless the contrary is proved, that such person has removed, damaged, cut, flattened or raised such game proof fence or adequate fence or that he has constructed or retained the said game-trap therein with intent to drive or lure game or other wild animals from such other farm or piece of land onto the first- mentioned farm or piece of land or to allow game or other wild animals to pass or escape from such other farm or piece of land to such- first mentioned farm or piece land.(A6/88/6)

(4) In any prosecution for a contravention of the provisions of section 40(1) or the provisions of section 42(4) any person caught in the act of removing any game or other wild animal from any snare, pitfall, trap, springtrap, net, bird lime or other device or in the act of capturing such game or other wild animal by any means whatsoever shall, unless the contrary is proved, be deemed to have brought or to have made such article, device or means on the land on which he was so caught and to have caught such game or other wild animal by means of such article, device or means.

(5) In any prosecution for an offence in terms of the provisions of section 42, any person in whose possession a weapon or ammunition mentioned in that section is found under circumstances indicating that game has been or is being hunted or presumably was or is being hunted with such weapon or

ammunition, shall be deemed to have used such weapon or ammunition contrary to the provisions of the said section, unless the contrary is proved.

(6) Every person found in possession of the game meat or trophy obviously not older than seven days, of any specially protected game, protected game, huntable game or huntable game birds shall be deemed to have hunted such specially protected game, protected game huntable game or huntable game birds unless the contrary is proved.

(7) Whenever the game meat or the trophy of any specially protected game, protected game, huntable game or huntable game birds is found on a vehicle, vessel, boat, raft or aircraft or other means of conveyance, or at a camping or other place or in a house, every person on or at such vehicle, vessel, boat, raft, aircraft or other means of conveyance or at such camping or other place or house shall be deemed to be in possession of such game meat or trophy, unless the contrary is proved.

(8) Whenever in any prosecution for an offence in terms of this Ordinance it is alleged that an offence was committed in connection with or in respect of any species of game, wild animal, fish or indigenous or protected plant or either sex or particular class thereof, such species, sex or class shall be deemed to be correct until the contrary is proved.

(9) If any person found in possession of game meat in respect of which it is reasonably suspected that it is the meat of game hunted contrary to the provisions of this Ordinance, alleges that he has received such meat as a gift, the game referred to shall -

(a) if the person in whose possession the game meat concerned has been found or the person who he alleges has given it to him refuses or fails at the request of a nature conservator forthwith to point out the place where the game referred to has been killed to such nature conservator; or

(b) if the place where the game referred to has allegedly been killed, is so pointed out to a nature conservator but no clear evidence that game has been killed there is being found at that place, in any prosecution for an offence in terms of this Ordinance, unless the contrary is proved, be deemed to have been hunted at a place other than the place where the person in whose possession the game meat has been found or the person who he alleges has given it to him, alleges it was hunted.

General offence.

86. Any person who contravenes or fails to comply with any provision of this Ordinance or an instruction given thereunder or a requirement put thereunder or any condition, requirement or restriction of a permit, licence, registration, approval, permission or exemption issued or granted thereunder shall be guilty of an offence.

General penalty.

87. Any person who is convicted of an offence in terms of this Ordinance for which no penalty is expressly provided shall be liable on conviction -

(a) to a fine not exceeding two hundred and fifty rand or to imprisonment for a period not exceeding three months or to both such fine and such imprisonment if such person has not previously been convicted of such offence or, in the opinion of the court, a similar offence in terms of the provisions of a repealed ordinance or the law of any province of the Republic of South Africa;

(b) to a fine not exceeding five hundred rand or to imprisonment for a period not exceeding six months or to both such fine and such imprisonment. if such person has previously been convicted of an offence referred to in paragraph (a).

Continuous offences.

88. Any person convicted of an offence in terms of this Ordinance who after such conviction persists in the conduct or omission constituting such offence shall be guilty of a continuous offence and liable on conviction to a fine not exceeding ten rand in respect of every day he so persists.

Forfeiture and other orders.

89. (1) Whenever any person is convicted of an offence in terms of this Ordinance -

(a) the court convicting such person shall, subject to the provisions of this Ordinance, declare any game or wild animal or game meat or the skin, horn, tooth or tusk, egg, shell, ears, feet or head of any game

or wild animal or any fish or indigenous plant which is found in the possession of such person and which was used for the purpose of or in connection with the commission of such offence or in respect of which such offence has been committed, to be forfeited to the State; (A. 27/86/32(a))

(b) the Court convicting such person shall issue an order directing any licence or permit issued in terms of this Ordinance to the person so convicted to be withdrawn and cancelled;

(c) the court convicting such person may, subject to the provisions of this Ordinance, declare any weapon or ammunition, lamp, battery, fishing tackle, device or article referred to in section 42, animal or any other article or object which was used for the purpose of or in connection with the commission of such offence to be forfeited to the State; (A 27/86/32(b))

(d) the court convicting such person may, subject to the provisions of this Ordinance, declare any vehicle, vessel, raft, or aircraft used for the purpose of or in connection with the commission of such offence or for the purpose of conveying or removing any game or wild animal hunted or captured contrary to the provisions of this Ordinance, to be forfeited to the State. (A 27/86/32(c))

(2) Any forfeiture in terms of the provisions of subsection (1) (c) or (d) shall, notwithstanding anything to the contrary contained in any law, be ordered by the court irrespective of any rights which any person other than the convicted person has in respect of the forfeited weapon, ammunition, lamp, battery, fishing tackle, device or article referred to in section 42, animal or any other article or object, vehicle, vessel, raft or aircraft.

(3) A forfeiture or an order in terms of the provisions of subsection (I) shall be made or given in addition to any penalty, forfeiture or order that shall or may be imposed, made or given by the court in terms of this Ordinance.

(4) Anything forfeited in terms of the provisions of this section may be disposed of by the Executive Committee and the proceeds obtained therefrom shall be paid into the Territory Revenue Fund.

Jurisdiction of magistrates' courts in respect of punishments.

89A Notwithstanding anything to the contrary contained in any other law, a magistrate's court shall have jurisdiction to impose any punishment prescribed by this Ordinance. (A 27/86/32(d))

Repeal of laws

90. (1) Subject to the provisions of subsections (2) and (3) the laws mentioned in Schedule 1 are hereby repealed to the extent set out in the third column thereof.

(2) Any proclamation, regulation, notice, order, prohibition, authority, permit, licence, registration, approval, permission, exemption or document promulgated, issued, made, ordered, published, imposed, given or granted and any other act performed in terms of the provisions of any law repealed by subsection (1) shall, if not inconsistent with the provisions of this Ordinance, be deemed to have been promulgated, issued, made, ordered, published, imposed, given, granted or performed in terms of the corresponding provisions of this Ordinance.

(3) Any person appointed in terms of the provisions of an ordinance repealed by subsection (1) or a proclamation or regulation promulgated thereunder to perform duties similar to those duties required of a person appointed in terms of this Ordinance shall be deemed to have been appointed in terms of the provisions of this Ordinance.

Short title.

91. This Ordinance shall be called the Nature Conservation Ordinance, 1975.

SCHEDULE 1 LAWS REPEALED.

Number and Year of Law	Short title	Extent to which repealed
Ordinance 6 of 1935.	Extermination of Vermin Ordinance, 1935.	The whole.
Ordinance 10 of 1949	Extermination of Wild Dogs Amendment Ordinance, 1949	The whole.

Proclamation 43 of 1949.	Vermin Extermination Proclamation, 1949	Amendment	The whole.
Ordinance 11 of 1958.	Extermination of Vermin Amendment Ordinance, 1958.		The whole.
Ordinance 23 of 1965.	Extermination of Vermin Amendment Ordinance, 1965.		The whole.
Ordinance 31 of 1967.	Nature Conservation Ordinance, 1967.		The whole.
Ordinance 3 of 1968.	Nature Conservation Ordinance, 1968.	Amendment	The whole
Ordinance 12 of 1969.	Nature Conservation Ordinance, 1969.	Amendment	The whole.
Ordinance 29 of 1969.	Nature Conservation Further Amendment Ordinance, 1969.		The whole.
Ordinance 21 of 1970.	Nature Conservation Ordinance, 1970.	Amendment	The whole.
Ordinance 21 of 1971.	Nature Conservation Ordinance, 1971.	Amendment	The whole.
Ordinance 6 of 1972.	Nature Conservation Ordinance, 1972.	Amendment	The whole.
Ordinance 8 of 1973.	Nature Conservation Ordinance, 1973.	Amendment	The whole.
Government Notice 74 of 1972.			The whole.

Application of Ordinance 4 of 1975.

34. The Ordinance and all amendments thereof as well as all regulations made thereunder, shall, with effect from the date of commencement of this Act, apply also in those territories in which the laws repealed by section 33 were in force immediately before the date of commencement of this Act.

Short title.

35. This Act shall be called the Nature Conservation Amendment Act, 1986.

SCHEDULE LAWS REPEALED

No. and year	Short title	Extent to which repealed
Ordinance 5 of 1927	Game Preservation Ordinance 1927	The whole in so far as it is still in force in Eastern Caprivi
Ordinance 19 of 1937	Fauna and Flora Protection Ordinance, 1937.	The whole in so far as it is still in force in Eastern Caprivi.
Proclamation R. 1023 of 1973	Owambo Nature Conservation Enactment, 1973.	The whole.
Act 4 of 1974 Kavango Legislative Council	Kavango Nature Conservation Act, 1974.	The whole.
Proclamation R. 188 of 1976	Nature Conservation in Certain Native Areas in South West Africa Proclamation, 1976.	The whole.

SCHEDULE 2.**DEFINITION OF THE BOUNDARIES OF THE ETOSHA NATIONAL PARK.**

From a point where the southern boundary of the magisterial district of Owambo intersects the western road reserve boundary of trunk road 1, section 10, south-eastwards along the said road reserve boundary, but excluding the adjoining airfield, to a point where the said road reserve boundary intersects the northern boundary of the farm Cordonia 1067, situated in Registration Division "B"; thence westwards along the northern boundaries of the farms Cordonia 1067 and Onguma 314 to the north-western corner beacon of the last-mentioned farm; thence generally southwards along the boundaries of but excluding the following farms in succession, all situated in Registration Division "B", namely Onguma 314, Vergenoeg 942, Kleinbegin 941, Leeudrink 940, Farm 858, Nadubib 1083, Heliodor 857, Obab 856, Mara 840, Lynplaas 436, Vrede 435, Olifantslaagte 433, Nooitgedag 418 and Hestria 417 to the north-western corner beacon of the last-mentioned farm; thence generally westwards along the boundaries of, but excluding the following farms in succession, all situated in Registration Division "A", namely Renex 494, Grensplaas 473, Tsabis 470, Werda 469, Nuchas 468, Elandsfontein 463, Mooiplaas 462, Koppies 457, Oberland 455, Montebello 456, Leeupoort 441, Margo 438, Tiervlei 436, Sonop 434, Burgershof 432, Avond-vrede 439, Stillerus 429, Willina 427, Volouiga 424, Moesamoeroep 421, Safari 663, Leeurante 660, Seringetti 659, Farm 656, Grenswag 655, Vlakwater 652, Helaas 649, Pionier 648, Robyn 647 and Ermo 646 to the north-western corner beacon of the last-mentioned farm; thence southwards along the western boundary of the said farm Ermo 646 to the southwestern corner beacon, thereof; thence eastwards along the northern boundaries of the following properties in succession namely Portion 4 of the farm Kaross 237 and Portion 2 of the farm Kaross 237 to the northeastern corner beacon of the last-mentioned property; thence southwards along the boundary of the said property, Portion 2 of the farm Kaross 237, to the south-eastern corner beacon thereof; thence westwards along the boundaries of the following properties in succession namely Portion 2 of the farm Kaross 237, Portion 4 of the farm Kaross 237, Portion 3 of the farm Kaross 237 and the farm Swartskamp 640 to a point on the southern boundary of the last-mentioned farm where the said boundary intersects the eastern road reserve boundary of main road 67; thence northwards along the eastern boundary of the said road reserve to a point where it intersects the northern boundary of the farm Kowares 276; thence north-eastwards in a straight line to a point 5 kilometres due east of the waterhole Onaiso; thence north-westward in a straight line to the southeastern corner beacon of Quarantine Station 740; thence generally northwards along the boundary of but excluding the said Quarantine Station 740 to the southwestern corner beacon of Quarantine Station 742; thence eastwards along the southern boundary of the last-mentioned Quarantine Station to the south-eastern corner beacon thereof; thence generally eastwards to a point south-east of Otjivalunda East Salt Pan; thence generally north-eastwards in a straight line, but excluding the said pan, to a point where the said straight line meets the southern boundary of the magisterial district of Owambo; thence eastwards along the southern boundary of the said magisterial district to a point where the said boundary intersects the western road reserve boundary of trunk road 1, section 10, being the point of beginning.

SCHEDULE 3.**SPECIALLY PROTECTED GAME.**

Mountain Zebra (*Equus zebra hartmannae*)
 Giraffe (*Giraffa camelopardalis*)
 Klipspringer (*Oreotragus oreotragus*)
 Elephant (*Loxodonta africana*)
 Rhinoceros (*Diceros bicornis*)
 Impala (*Aepyceros melampus*)
 Hippopotamus (*Hippopotamus amphibius*)
 Black-faced Impala (*Aepyceros petersi*)
 White Rhinoceros (*Ceratotherium simum*)
 Zebra (*Equus burchelli* species)
 (Subst. Act 31/90/3)
 (GN 75/87 Zebra (*Equus burchelli* species))

SCHEDULE 4.
PROTECTED GAME.

(i) *Animals.*

Aardwolf (*Proteles cristatus*)
 Bat-eared Fox (*Otocyon megalotis*)
 Roan Antelope (*Hippotragus equinus*)
 Tsesseby (*Damaliscus lunatus*)
 Dikdik (*Madoqua kirki damarensis*)
 Blue Wildebeest (*Connochaetes taurinus*)
 Bushbuck (*Tragelaphus scriptus*)
 Duiker (*Sylvicapra grimmia*)
 Antbear (*Orycteropus afer*)
 Clawless Otter (*Aonyx capensis*)
 Scaly Anteater (*Manis tem mincki*)
 Cheetah (*Acinonyx jubatus*)
 Spotted-necked Otter (*Lutra maculicollis*)
 Hedgehog (*Erinaceus frontalis*)
 Monitor (*Veranus niloticus*; *Veranus niloticus*; *V albigularis*)
 Leopard (*Panthera pardus*)
 Pythons (*Python sebae*, *Python anchietac*)
 Bush Baby (*Galago Senegalensis*)
 Oribi (*Ourebia ourebi*)
 Honey Badger (*Mellivora capensis*)
 Reedbuck (*Redunca arundinum*)
 Red Hartebeest (*Alcelaphus buselaphus*)
 Silver Jackal (*Vulpes chama*)
 Tortoises (*Testudinidae*)
 Steenbok (*Rhaphicerus campestris*)
 Sable Antelope (*Hippotragus niger*)
 Waterbuck (*Kobus ellipsiprymanus*)
 Sitatunga (*Tragelaphus spekei*) {GN 75/87 names added}
 Eland (*Taurotragus oryx*)
 Lechwe (*Kobus leche*)
 Crocodile (*Crocodylus niloticus*)
 Puku (*Kobus vardoni*)
 Sharp's grysbok (*Rhaphicerus sharpei*)
 (GN 90/88;GN 75/87 names added)

(ii) *Birds.*

All species of birds except the huntable game birds mentioned in Schedule 6 and the following birds:
 Weavers (All *Ploceus* spp.)
 Sparrows (All *Passet* spp.)
 Mousebirds (*Colius colius*; *Urocolius indicus*)
 Redheaded Quelea (*Quelea quelea*)
 Bulbul (*Pycnonotus nigricans*; *P. barbatus*)
 Pied Crow (*Corvus albus*).

SCHEDULE 5.
HUNTABLE GAME.

Bushpig (*Potamochoerus porcus*)
 Buffalo (*Syncerus caffer*)
 Eland (*Taurotragus oryx*)
 Oryx (*Oryx gazella*)
 Kudu (*Tragelaphus Strepsiceros*)
 Springbok (*Antidorcas marsupialis*)

Warthog (Phacochoerus aethiopicus).

**SCHEDULE 6.
HUNTABLE GAME BIRDS.**

- Guinea Fowl (Numida meleagris)
- Namaqua Sandgrouse (Pterocles namaqua).
- Kurrichane buttonquail (Turnix sylvatica)
- Common quail (Cortunix cortunix)
- Harlequin quail (Cortunix delagorguei)
- Crested francolin (Francolinus sephaena)
- Redbilled francolin (Francolinus adspersis)
- Swainson's francolin (Francolinus swainsonii)
- Orange River francolin (Francolinus levaillantoides)
- White faced duck (Dendrocygna ciduata)
- Egyptian goose (Alopochen aegyptiacus)
- Cape teal (Anas capensis)
- Hottentot teal (Anas hottentota)
- Turtle dove (Streptopelia capicola)
- Laughing dove (Streptopelia senegalensis)
- Rock pigeon (Columba guinea)
- Burchell's sandgrouse (Pterocles burchelli)
- and
- Doublebanded sandgrouse (Pterocles bicinctus)

SCHEDULE 7

ADMINISTRASIE - S.W.A. - ADMINISTRATION

AANSOEK OM'N WILDHANDELAARSLISENSIE/APPLICATION FOR A GAME DEALER'S LICENCE (Ordonnansie op Natuurbewaring, 1975/Nature Conservation Ordinance, 1975)

Jaar eindigende.....Year ending
 Naam van applikant.....Name
 of applicant
 Adres.....Address
 Ligging van grond waar (.....(Situation of land on
 - wild of wilde diere aanwild).....(which game or
 gehou sal word).....(animals will be kept
 Besonderhede van lisensie).....(Particulars of
 lisensie
 verlang).....(required
 Vorige ondervindingPrevious
 experience

.....
HANDTEKENING/SIGNATURE
DATUM.....DATE.

SCHEDULE 8

ADMINISTRASIE - S.W.A. - ADMINISTRATION

WILDHANDELAARSLISENSIE/GAME DEALER'S LICENCE

(Ordonnansie op Natuurbewaring, 1975 /Nature Conservation Ordinance, 1975)

VERVALDATUM.....DATE OF EXPIRY

Uitgereik aan:

Issued to:

LisensiehouerLicence Holder

AdresAddress

Lisensiegeld betaal, ontvangs Licence fee paid, receipt of

waarvan hierby erken word: which is hereby acknowledged:

RAND.....RAND

SENT.....CENT

R

Besonderhede van lisensie Particulars of licence

.....

Ligging van grond waar).....(Situation of land on
 wild of wilde diere aan-).....(which game or wild
 gehou sal word).....(animals will be kept

.....
LISENSIEBEAMPTE/LICENCING OFFICER**SCHEDULE 9****PROTECTED PLANTS.**

Common name. Scientific name.

AIZOACEAE.

Vygies

Aridaria noctiflora Astridia

all species Cephalophyllum

all Species

Chasmatophyllum -

musculinum Cheiridopsis

all species Conophytum all

species Dinteranthus all

Species

Ebracteola all Species

Fenestraria aurantiaca

Fenestraria rhopalophylla

Hereroa all species

Jensenobotrya lossowiana

Juttadinteria all species

Lapidaria margaretae

Lithops all Species

Nananthus abides

Ophthalmophyllum

all species

Psammophora all Species

Ruschia all Species

Schwantesia all

species Stoeberia all

species

Titanopsis all species

Mountain Vygie

Window plant, yellow

Window Plant, white

Herero Vygie

Jensenobotrya

Juttadinteria

Vygie

Plains Vygie Vygie

Rusch's Vygies Vygie

Kalk Vygie Vygie

APOCYNACEAE.

Bottle tree

Elephant's trunk

ASCLEPIADACEAE

Carrion-flower species

Ghaap species

CRASSULACEAE.

LILIACEAE.

Small Aloe

Variegated Aloe

Gloriosa

Small Haworthia

MORINGACEAE.

Moringa

ORCHIDACEAE.

Orchids

PEDALEACEAE

Grapple plant

(GN 247/77)

PORTULACACEAE.

Small Elephant's Foot

VITACEAE.

Butter Tree species

Stem Succulent species

WELWITSCHIACEAE.

Welwitschia

Pachypodium lealii

Pachypodium namaquanum

Caralluma all Species

Ceropegia all Species

Decabelone barklyi

Duvalia all species

Hoodia all species

Huernia all species

Huerniopsis all species

Piaranthus all species

Stapelia all species

Tavaresia: sec Derabelone
species

Trichocaulon all species

Adromischus all species

Crassula all species

Aloe all species

Chortolirion bergerianum

Gasteria (ernesti-ruschii)
pillansii

Gloriosa virescens

Haworthia tessellata var.
engleri

Moringa ovalifolia

Orchidaceae all genera and
species

Hepagophytum

procumbens

Anacampseros all species

Portulacaria pygmaea

Cyphostemma (Cissus)

Welwitschia mirabilis.



GOVERNMENT GAZETTE

OF THE

REPUBLIC OF NAMIBIA

N\$6.40

WINDHOEK - 27 December 2007

No. 3966

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Government Notice

OFFICE OF THE PRIME MINISTER

No. 232

2007

PROMULGATION OF ACT OF PARLIAMENT

The following Act which has been passed by the Parliament and signed by the President in terms of the Namibian Constitution is hereby published in terms of Article 56 of that Constitution.

No. 7 of 2007: Environmental Management Act, 2007.

Act No. 7, 2007 ENVIRONMENTAL MANAGEMENT ACT, 2007**ACT**

To promote the sustainable management of the environment and the use of natural resources by establishing principles for decision making on matters affecting the environment; to establish the Sustainable Development Advisory Council; to provide for the appointment of the Environmental Commissioner and environmental officers; to provide for a process of assessment and control of activities which may have significant effects on the environment; and to provide for incidental matters.

(Signed by the President on 21 December 2007)

BE IT ENACTED by the Parliament of the Republic of Namibia, as follows:

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2. Object of Act

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3. Principles of environmental management

PART III**GENERAL FUNCTIONS AND POWERS OF MINISTER**

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PART I
DEFINITIONS AND OBJECT OF ACT

Definitions

1. In this Act, unless the context indicates otherwise -

"activity" means a physical work that a proponent proposes to construct, operate, modify, decommission or abandon or an activity that a proponent proposes to undertake;

"Advisory Council" means the Sustainable Development Advisory Council established by section 6;

"assessment" means the process of identifying, predicting and evaluating -

- (a) the significant effects of activities on the environment;
- (b) the risks and consequences of activities and their alternatives and options for mitigation with a view to minimise the effects of activities on the environment and to maximise the benefits and to promote compliance with the principles set out in section 3;

"assessment report" means a report that presents the procedures and findings of an assessment;

"authorisation" means an approval, licence, permit or other authorisation by a competent authority in respect of a listed activity;

"biological diversity" means the variability among living organisms from all sources, including amongst others, terrestrial and aquatic ecosystems and the ecological complexes of which they are part, and this includes diversity within species, between species and of ecosystems;

"competent authority" means -

- (a) an organ of state which is responsible, under any law, for granting or refusing an authorisation; or
- (b) the competent authority identified in terms of section 30;

"Criminal Procedure Act" means the Criminal Procedure Act, 1977 (Act No. 51 of 1977);

"environment" means the complex of natural and anthropogenic factors and elements that are mutually interrelated and affect the ecological equilibrium and the quality of life, including -

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- (a) the natural environment that is the land, water and air, all organic and inorganic material and all living organisms; and
- (b) the human environment that is the landscape and natural, cultural, historical, aesthetic, economic and social heritage and values;

"environmental clearance certificate" means an environmental clearance certificate issued in terms of section 34 or 37, authorising a listed activity to be undertaken;

"Environmental Commissioner" means the Environmental Commissioner appointed in terms of section 16;

"environmental officer" means an environmental officer appointed in terms of section 18;

"environmental plan" means an environmental plan referred to in section 24;

"Fund" means the Environmental Investment Fund of Namibia established by section 2 of the Environmental Investment Fund of Namibia Act, 2001 (Act No. 13 of 2001);

"listed activity" means an activity listed in terms of section 27(1) or 29;

"Minister" means the Minister responsible for environment;

"Ministry" means the Ministry responsible for the administration of matters relating to the environment;

"organ of state" means -

- (a) any office, ministry or agency of State or administration in the local or regional sphere of government; or
- (b) any other functionary or institution -
 - (i) exercising a power or performing a function in terms of the Namibian Constitution; or
 - (ii) exercising a public power or performing a public function in terms of any law,

but does not include a court or a judicial officer;

"Permanent Secretary" means the Permanent Secretary of the Ministry;

"person" includes an organ of state;

"premises" includes land and any building, structure, vehicle, ship, vessel, aircraft or container;

"prescribe" or "prescribed" means prescribe or prescribed by regulation;

"proponent" means a person who proposes to undertake a listed activity;

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“regulation” means a regulation made under this Act;

“review” when used in Part VIII, means the process of determining whether an assessment has been carried out correctly or whether the resulting information is adequate in order to make a decision;

“significant effect” means having, or likely to have, a consequential qualitative or quantitative impact on the environment, including changes in ecological, aesthetic, cultural, historic, economic and social factors, whether directly or indirectly, individually or collectively;

“staff member” means a staff member as defined in section (1) of the Public Service Act, 1995 (Act No. 13 of 1995);

“sustainable development” means human use of a natural resource, whether renewable or non-renewable, or the environment, in such a manner that it may equitably yield the greatest benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations including the maintenance and improvement of the capacity of the environment to produce renewable resources and the natural capacity for regeneration of such resources; and

“this Act”, includes any notice or regulation issued or made under this Act.

Object of Act

2. The object of this Act is to prevent and mitigate, on the basis of the principles set out in section 3, the significant effects of activities on the environment by -

- (a) ensuring that the significant effects of activities on the environment are considered in time and carefully;
- (b) ensuring that there are opportunities for timeous participation of interested and affected parties throughout the assessment process; and
- (c) ensuring that the findings of an assessment are taken into account before any decision is made in respect of activities.

PART II**PRINCIPLES OF ENVIRONMENTAL MANAGEMENT****Principles of environmental management**

3. (1) The principles set out in subsection (2) -
 - (a) guide the implementation of this Act and any other law relating to the protection of the environment;
 - (b) serve as the general framework within which environmental plans must be formulated; and
 - (c) serve as guidelines for any organ of state when making any decision in terms of this Act or any other law relating to the protection of the environment.

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- (2) The following are the principles of environmental management: -
- (a) renewable resources must be used on a sustainable basis for the benefit of present and future generations;
 - (b) community involvement in natural resources management and the sharing of benefits arising from the use of the resources, must be promoted and facilitated;
 - (c) the participation of all interested and affected parties must be promoted and decisions must take into account the interest, needs and values of interested and affected parties;
 - (d) equitable access to environmental resources must be promoted and the functional integrity of ecological systems must be taken into account to ensure the sustainability of the systems and to prevent harmful effects;
 - (e) assessments must be undertaken for activities which may have a significant effects on the environment or the use of natural resources;
 - (f) sustainable development must be promoted in all aspects relating to the environment;
 - (g) Namibia's cultural and natural heritage including, its biological diversity, must be protected and respected for the benefit of present and future generations;
 - (h) the option that provides the most benefit or causes the least damage to the environment as a whole, at a cost acceptable to society, in the long term as well as in the short term must be adopted to reduce the generation of waste and polluting substances at source;
 - (i) the reduction, re-use and recycling of waste must be promoted;
 - (j) a person who causes damage to the environment must pay the costs associated with rehabilitation of damage to the environment and to human health caused by pollution, including costs for measures as are reasonably required to be implemented to prevent further environmental damage;
 - (k) where there is sufficient evidence which establishes that there are threats of serious or irreversible damage to the environment, lack of full scientific certainty may not be used as a reason for postponing cost-effective measures to prevent environmental degradation; and
 - (l) damage to the environment must be prevented and activities which cause such damage must be reduced, limited or controlled.

Act No. 7, 2007 ENVIRONMENTAL MANAGEMENT ACT, 2007**PART III
GENERAL FUNCTIONS AND POWERS OF MINISTER****Functions of Minister**

4. The Minister's functions are to -
- (a) determine policies for the management, protection and use of the environment;
 - (b) prepare and publish policies, strategies, objectives and standards for the management and protection of the environment;
 - (c) co-ordinate environmental management at national level; and
 - (d) monitor and ensure compliance with this Act.

Powers of Minister in respect of waste

5. (1) In this section -
- (a) "disposal site" means a site used for the accumulation of waste with the purpose of disposing or treatment of such waste; and
 - (b) "waste" means any matter, whether gaseous, liquid or solid or any combination thereof, which is from time to time listed by the Minister by notice in the *Gazette* or by regulation as an undesirable or superfluous by-product, emission, residue or remainder of any process or activity.
- (2) The Minister, after following the consultative process referred to in section 44 may, by notice in the *Gazette* or by regulation, declare a site to be a waste disposal site.
- (3) Where a waste disposal site already exists in terms of any law, the Minister may approve that site as a waste disposal site for the purpose of this section.
- (4) A person may not discard or cause to be discarded waste or dispose of it in any other manner, except -
- (a) at a disposal site declared or approved by the Minister in terms of this section; or
 - (b) in a manner or by means of a facility or method and subject to such conditions as the Minister may prescribe.
- (5) Any person who contravenes subsection (4) commits an offence and is on conviction liable to a fine not exceeding N\$500 000 or to imprisonment for a period not exceeding 25 years or to both such fine and such imprisonment.

Act No. 7, 2007 ENVIRONMENTAL MANAGEMENT ACT, 2007**PART IV
SUSTAINABLE DEVELOPMENT ADVISORY COUNCIL****Establishment of Advisory Council**

6. There is established an advisory council to be known as the Sustainable Development Advisory Council.

Functions of Advisory Council

7. The functions of the Advisory Council are to -
- (a) promote co-operation and co-ordination between organs of state, non-governmental organisations, community based organisations, the private sector and funding agencies, on environmental issues relating to sustainable development;
 - (b) advise the Minister -
 - (i) on the development of a policy and strategy for the management, protection and use of the environment;
 - (ii) on the conservation of biological diversity, access to genetic resources in Namibia and the use of components of the environment in a way and at a rate that does not lead to the long-term decline of the environment, thereby maintaining its potential to meet the needs and aspirations of present and future generations;
 - (iii) on appropriate methods of monitoring compliance with the principles set out in section 3;
 - (iv) on the need for, and initiation or amendment of legislation, on matters relating to the environment; and
 - (c) perform other functions assigned to it by the Minister.

Composition of Advisory Council

8. (1) The Advisory Council consists of the following members appointed by the Minister -

- (a) four persons who represent the interests of the State; and
- (b) four persons whom the Minister reasonably believes represent the interests of organisations, associations or institutions concerned with environmental matters.

(2) The Environmental Commissioner is an *ex officio* member of the Advisory Council, but may not vote at its meetings.

(3) Persons appointed as members of the Advisory Council must have the necessary knowledge of, or experience in, matters relating to the functions of the Advisory Council.

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(4) When any nomination in terms of subsection (1)(a) becomes necessary, the Minister must invite the State to nominate persons within a period of 30 days from the date of the invitation.

(5) When any nomination in terms of subsection (1)(b) becomes necessary, the Minister must invite the public, organisations, associations or institutions by notice in the *Gazette* and in any other appropriate manner, to nominate persons within a period of 30 days from the date of the notice.

(6) If, after the Minister has invited nominations in terms of subsections (4) or (5), the Minister receives no or insufficient nominations within the period specified in the notice, the Minister may appoint the required number of persons who qualify for appointment in terms of this section.

(7) The Minister must designate one of the members of the Advisory Council as chairperson.

(8) The Minister must, as soon as possible after appointing the members of the Advisory Council, make known in the *Gazette* -

- (a) the name of every person appointed as a member;
- (b) the period for which the appointment is made; and
- (c) the date from which the appointment takes effect.

(9) The Advisory Council may with the approval of the Minister co-opt any person to assist it in its functions, but the person co-opted may not vote at meetings of the Advisory Council.

(10) The Advisory Council may establish one or more committees consisting of members only or consisting of members and non-members to perform, subject to the Advisory Council's directions, functions the Advisory Council may assign to such committee.

Term of office of members of Advisory Council

9. Subject to section 10, a member of the Advisory Council holds office for a term of three years and may be reappointed at the end of that term.

Vacation of office and filling of vacancies

10. (1) The office of a member of the Advisory Council becomes vacant if the member -

- (a) is absent from three consecutive meetings of the Advisory Council without the permission of the Advisory Council;
- (b) through a written notice addressed to the Minister, resigns from office;
- (c) ceases to represent the State, organisation, association or institution for which the member has been appointed; or

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(d) is for any other reasonable cause removed from office by the Minister.

(2) Before removing a member from office in terms of subsection (1)(d), the Minister must -

- (a) in writing notify the member concerned of the grounds on which the member is to be removed from office;
- (b) give the member an opportunity to make oral or written representations on the matter to the Minister or to any person designated by the Minister; and
- (c) consider any representations made in terms of paragraph (b).

(3) If a member of the Advisory Council dies or vacates office before the expiry of his or her term of office the Minister must, in accordance with section 8, appoint a person to fill the vacancy for the unexpired portion of the term for which that member was appointed.

Meetings of Advisory Council

11. (1) The Advisory Council must meet at least two times a year.

(2) The first meeting of the Advisory Council must be held at a place, date and time determined by the Minister and thereafter any meeting of the Advisory Council must be held at a place, date and time determined by the chairperson of the Advisory Council.

(3) The chairperson may at any time call a special meeting of the Advisory Council, at the request of the Minister or of a majority of the members.

(4) At the first meeting of the Advisory Council the members must elect from among their number a deputy chairperson.

(5) The chairperson of the Advisory Council, or in the absence of the chairperson, the deputy chairperson, presides at meetings of the Advisory Council, or if both the chairperson and deputy chairperson are absent from the meeting, or are unable to preside at the meeting, the members must elect a member to preside at the meeting.

(6) At any meeting of the Advisory Council -

- (a) a majority of the members of the Advisory Council forms a quorum;
- (b) a decision of a majority of members of Advisory Council present at a meeting is the decision of the Advisory Council; and
- (c) if, there is an equality of votes, the person presiding at the meeting has a casting vote in addition to that person's ordinary vote.

(7) The Advisory Council determines the procedures to be followed at its meetings.

(8) As soon as possible after a meeting of the Advisory Council has taken place, the chairperson must cause a copy of the minutes to be submitted to the Minister.

Act No. 7, 2007 ENVIRONMENTAL MANAGEMENT ACT, 2007**Administration of Advisory Council**

12. (1) The Permanent Secretary must -

- (a) make staff members in the Ministry available to perform the clerical work for the Advisory Council in the performance of its functions; and
- (b) designate a staff member of the Ministry as secretary of the Advisory Council.

(2) The expenditure resulting from the performance of the duties and functions of the Advisory Council in terms of subsection (1) must be paid from the State Revenue Fund from moneys appropriated for that purpose by Parliament.

Allowances of members of Advisory Council and committees

13. Members of the Advisory Council and of a committee of the Advisory Council who are not in the full time employment of the State are entitled to such allowances as the Minister, with the concurrence of the Minister responsible for finance, may determine.

Disclosure of interest

14. (1) If a member of the Advisory Council or of a committee of the Advisory Council has a direct or indirect financial or other interest in a matter being dealt with or about to be dealt with by the Advisory Council or a committee of the Advisory Council, the member must as soon as is possible after the relevant facts come to the member's knowledge, disclose the nature of the interest to the chairperson of the Advisory Council.

(2) Any disclosure made under this section must be noted in the minutes of the relevant meeting of the Advisory Council.

(3) A member of the Advisory Council or of a committee of the Advisory Council who contravenes subsection (1) commits an offence and is on conviction liable to a fine not exceeding N\$10 000 or to imprisonment for a period not exceeding two years or to both such fine and such imprisonment.

Annual report

15. (1) As soon as possible after the end of each financial year as defined in the State Finance Act, 1991 (Act No. 31 of 1991), the Advisory Council must prepare an annual report in accordance with subsection (2).

(2) The annual report must include -

- (a) a report on the activities of the Advisory Council; and
- (b) any other matter the Minister may consider necessary to be included in the report.

(3) As soon as possible after the annual report has been prepared, the chairperson of the Advisory Council must cause a copy of the report to be submitted to the Minister.

(4) The Minister must lay a copy of the Advisory Council's annual report before

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the National Assembly within 30 days of receipt thereof, if the National Assembly is then in ordinary session, or if the National Assembly is not then in ordinary session, within 30 days after the commencement of the next ordinary session.

PART V**ENVIRONMENTAL COMMISSIONER AND ENVIRONMENTAL OFFICERS****Appointment of Environmental Commissioner**

16. (1) The Minister must, subject to the laws governing the public service, appoint a person who is suitably qualified and experienced in environmental matters -

- (a) to be the Environmental Commissioner; and
- (b) to be the Deputy Environmental Commissioner, who must perform the duties and functions of the Environmental Commissioner when there is no Environmental Commissioner or when the Environmental Commissioner is absent or is for any other reason unable to perform his or her functions.

(2) The Environmental Commissioner may perform any duty or function or exercise any power of an environmental officer.

(3) The Permanent Secretary must make staff members of the Ministry available to assist the Environmental Commissioner in the performance of any duty or function or the exercise of any power in terms of this Act.

Functions of Environmental Commissioner

17. (1) The Environmental Commissioner must perform the functions set out in subsection (2), subject to the general or specific policy directives of the Minister.

- (2) The functions of the Environmental Commissioner are to -
- (a) advise organs of state on the preparation of environmental plans;
 - (b) receive and record applications for environmental clearance certificates;
 - (c) determine whether a listed activity requires an assessment;
 - (d) determine the scope, procedure and methods of an assessment;
 - (e) review the assessment report in accordance with this Act;
 - (f) issue environmental clearance certificates in terms of this Act;
 - (g) maintain a register of environmental assessments undertaken in terms of this Act;
 - (h) maintain a register of environmental clearance certificates issued and environmental plans approved in terms of this Act;
 - (i) conduct inspections for monitoring compliance with this Act; and
 - (j) perform any other duty or function which the Minister may assign or prescribe.

Act No. 7, 2007 ENVIRONMENTAL MANAGEMENT ACT, 2007**Appointment of environmental officers**

18. (1) Subject to the laws governing the public service, the Minister may appoint environmental officers, as he or she may consider necessary for carrying out the provisions of this Act.

(2) If the Minister considers it necessary, and subject to such conditions as the Minister may from time to time and in consultation with the Minister responsible for finance determine, the Minister may appoint any person who is not in the full-time employment of the State as an environmental officer in any particular case or may so appoint such person to assist an environmental officer appointed in terms of subsection (1).

(3) Before appointing persons employed in any other organ of state, as environmental officers, the Minister must obtain the consent of the relevant employer.

(4) The Minister may withdraw the appointment of an environmental officer.

(5) Each environmental officer appointed in terms of subsection (1) or (2) must be furnished with a certificate of appointment in the form determined by the Permanent Secretary and stating that he or she has been appointed as an environmental officer, but if his or her appointment as environmental officer is limited to any particular function or functions his or her certificate must state such limitation.

(6) When performing any function or duty or exercising any power in terms of this Act, an environmental officer must on demand by any person in relation to whom the function, duty or power is performed or exercised, produce the certificate of appointment.

Entry and inspection

19. (1) In this section "member of the police" means a member of the Namibian Police Force as defined in section 1 of the Police Act, 1990 (Act No. 19 of 1990).

(2) To the extent that this section authorises the interference with the privacy of persons homes, correspondence or communications as contemplated in Article 13(1) of the Namibian Constitution, this section is enacted on the authority of Sub-Article (2) of that Article.

(3) An environmental officer may, on the authority of a warrant issued in terms of subsection (5) -

(a) in order to obtain evidence, enter premises where he or she has reason to believe that any provision of this Act has been or is being contravened;

(b) direct the person in control of or employed at the premises -

(i) to deliver any book, record or other document that relates to the investigation and which is in the possession or under the control of that person;

(ii) to furnish such information as he or she has with regard to that matter; and

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- (iii) to render such assistance as the environmental officer requires in order to enable him or her to perform his or her duties or functions under this Act;
 - (c) inspect any book, record or other document and make copies of it or excerpts from it;
 - (d) seize any, material, substance, book, record or other document which is or may be relevant to a prosecution under this Act and keep it in his or her custody, but the person from whose possession or control any book, record or document has been taken, may, at his or her own expense and under supervision of the environmental officer concerned, make copies of it or excerpts from it; and
 - (e) take samples of any material or substance seized in terms of paragraph (d), for analysis.
- (4) An environmental officer conducting a search under subsection (3) and (10) may -
- (a) request a member of the police to assist in the exercise of the powers referred to in this section; and
 - (b) request any person to assist as an interpreter or otherwise in the exercise of the powers referred to in this section.
- (5) A warrant referred to in subsection (3) must be issued by a judge of the High Court or by a magistrate who has jurisdiction in the area where the premises in question are situated, and may only be issued if it appears from information on oath that there are reasonable grounds for believing that any material, substance or other things contemplated in subsection (3) is on or in such premises, and must specify which of the acts mentioned in that subsection may be performed in terms of the warrant by the person to whom it is issued.
- (6) Any environmental officer executing a warrant in terms of this section must immediately before commencing the execution -
- (a) identify himself or herself to the person in control of the premises, if such person is present, and hand to such person a copy of the warrant or, if such person is not present, affix such copy in a prominent place on the premises; and
 - (b) supply such person at the request of such person, with particulars regarding his or her authority to execute such a warrant.
- (7) A person may not enter or search any premises unless he has audibly demanded admission to the premises and has notified the purpose of his or her entry, unless such person is, on reasonable grounds, of the opinion that any material, substance or other things contemplated in subsection (3) may be destroyed if such admission is first demanded and such purpose is first notified.
- (8) Any entry and search in terms of this section must be executed by day, unless the execution of it by night is justifiable and necessary.

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(9) A warrant contemplated in this section may be issued on any day and is effective until -

- (a) it is executed;
- (b) it is cancelled by the person who issued it or, if such person is not available, by any person with similar authority;
- (c) one month from the date of its issue; or
- (d) the purpose for which the warrant was issued, no longer exists, whichever occurs first.

(10) An environmental officer may without a warrant enter on any premises and search for, seize and remove anything referred to in subsection (3), if -

- (a) the person who is competent to do so consents to such entry, search, seizure and removal; or
- (b) there are reasonable grounds to believe that -
 - (i) a warrant would be issued to the environmental officer if he applied for such warrant; and
 - (ii) the delay in obtaining such warrant would defeat the purpose of the search.

(11) A material or substance seized in terms of this section must be dealt with as contemplated in Chapter 2 of the Criminal Procedure Act.

Compliance orders

20. (1) For the purpose of this section "exceptional circumstances" includes circumstances in which the delay necessary to issue a written order that meets the requirements of subsection (2) would result in danger to human life or the environment.

(2) An environmental officer may issue a compliance order to a person whom the environmental officer has reason to believe -

- (a) has contravened this Act; or
- (b) has contravened a condition of an environmental clearance certificate.

(3) A compliance order must set out -

- (a) the name of the person to whom the order applies;
- (b) the provision or condition which has been contravened;
- (c) details of the nature and extent of the contravention;
- (d) any steps that are required to be taken and the period within which those steps must be taken; and

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- (e) any penalty that may be imposed in terms of this Act if those steps are not taken;
- (f) the procedure to be followed in lodging an objection to the compliance order with the Minister; and
- (g) any other prescribed matter.

(4) In exceptional circumstances a compliance order may be given orally, but within a period of seven days after such order is given, a written order must be issued in accordance with subsection (3).

(5) A person who receives a compliance order must comply with that order within the time period stated in the order unless the Minister has agreed to suspend the operation of the compliance order under section 21.

(6) Where a person fails to take any measures specified in the compliance order without raising an objection an environmental officer may take the measures or cause them to be taken.

(7) Any costs incurred by the environmental officer in connection with any action taken under subsection (6) may be recovered from the person referred to in that subsection as a debt owing to the State.

(8) Any person who, without good reason, fails or refuses to comply with a compliance order commits an offence and is liable on conviction to a fine not exceeding N\$500 000 or to imprisonment for a period not exceeding 25 years or to both such fine and such imprisonment.

Objections to compliance order

21. (1) Any person issued with an order in terms of section 20, may apply to the Minister in the prescribed form and manner for the review of the order within -

- (a) 14 days after receiving that order; or
- (b) such longer period as may be allowed by the Minister on good cause shown.

(2) After considering the application made in terms of subsection (1), and any other relevant information, the Minister may confirm, modify or cancel all or part of the order.

(3) If the Minister confirms or modifies all or part of a compliance order, the applicant must comply with that order as confirmed or modified, within the time period specified in it.

(4) The Environmental Commissioner must in the prescribed form and manner notify the person referred to in subsection (1), of the decision made in terms of subsection (2) and the reasons for the decision.

Offences in relation to environmental officers

22. (1) A person commits an offence if the person -

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- (a) hinders or obstructs an environmental officer in the performance of the environmental officer's duties and functions or the exercise of the environmental officer's powers;
- (b) without lawful excuse, refuses or fails to answer any question put by an environmental officer;
- (c) intentionally furnishes false and misleading information to an environmental officer; or
- (d) falsely claims to be an environmental officer.

(2) A person convicted of an offence contemplated in subsection (1) is liable to a fine not exceeding N\$20 000 or to imprisonment for a period not exceeding two years or to both such fine and such imprisonment.

PART VI
ENVIRONMENTAL PLANS

Objects of environmental plans

23. The objects of environmental plans are to -
- (a) co-ordinate and harmonise the environmental policies, plans, programmes and decisions of the various organs of state that exercise functions that may affect the environment or are entrusted with powers and duties aimed at the achievement, promotion, and protection of a sustainable environment, in order to -
 - (i) minimise the duplication of procedures and functions; and
 - (ii) promote consistency in the exercise of functions that may affect the environment; and
 - (b) enable the Minister to monitor the achievement, promotion and protection of a sustainable environment.

Environmental plans

24. (1) For the purpose of this Part, the Minister may identify and list by notice in the *Gazette* or by regulation organs of state which are exercising functions that may affect the environment.

(2) Every organ of state identified and listed in terms of subsection (1), must prepare an environmental plan in the prescribed form and manner.

(3) Every organ of state contemplated in subsection (1), must in the preparation of an environmental plan take into consideration every other environmental plan already adopted with a view to achieving consistency among such plans.

(4) The Environmental Commissioner may, at the request of an organ of state assist with the preparation of an environmental plan.

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(5) The Minister may issue guidelines to assist organs of state in the preparation of environmental plans.

Approval of environmental plans

25. (1) Every organ of state required to submit an environmental plan must submit the plan to the Environmental Commissioner within the prescribed period.

(2) The Environmental Commissioner must scrutinise every environmental plan and -

- (a) recommend the approval of the plan to the Minister;
- (b) report to the Minister as well as to every other identified organ of state on the extent to which the environmental plan concerned fails to comply with-
 - (i) the principles set out in section 3;
 - (ii) the objects of environmental plans specified in section 23; or
 - (iii) any relevant environmental plan,

and set out the changes needed in the environmental plan concerned.

(3) Where the environmental plan is approved by the Minister, the relevant organ of state must adopt and publish its plan in the *Gazette* within 90 days of the approval and the plan becomes effective from the date of publication.

(4) The exercise of functions by organs of state may not be delayed or postponed on account of -

- (a) the failure of any organ of state to submit an environmental plan;
- (b) the scrutiny of any environmental plan by the Environmental Commissioner;
- (c) the amendment of any environmental plan following scrutiny of the plan by the Environmental Commissioner; or
- (d) the failure of any organ of state to adopt and publish its environmental plan.

Compliance with environmental plans

26. (1) Every organ of state must exercise every function it may have, or that has been assigned or delegated to it, by or under any law, and that may significantly affect the protection of the environment, substantially in accordance with the environmental plan prepared and approved in accordance with this Part, but any substantial deviation from an environmental plan must be reported to the Environmental Commissioner.

(2) Every organ of state identified and listed in terms of section 24(1) must report annually to the Minister on the implementation of its adopted environmental plan.

(3) The Environmental Commissioner monitors compliance with environmental plans and may -

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- (a) take any steps or make any inquiries the Commissioner considers necessary in order to determine if environmental implementation plans are being complied with by organs of state; and
 - (b) if, as a result of any steps taken or inquiry made under paragraph (a), the Commissioner is satisfied that an environmental implementation plan is not substantially being complied with, serve a written notice on the organ of state concerned, calling on it to take such specified steps as the Commissioner considers necessary to remedy the non-compliance.
- (4) A copy of every environmental plan must be made available for public inspection, without charge, at the office of the Environmental Commissionr during office hours.

PART VII
ENVIRONMENTAL ASSESSMENT

Listing of activities and prohibition in respect of listed activities

27. (1) The Minister, after following the consultative process referred to in section 44, may list, by notice in the *Gazette*, activities which may not be undertaken without an environmental clearance certificate.

(2) Activities listed, under subsection (1), may include activities in respect of any of the following areas -

- (a) land use and transformation;
- (b) water use and disposal;
- (c) resource removal, including natural living resources;
- (d) resource renewal;
- (e) agricultural processes;
- (f) industrial processes;
- (g) transportation;
- (h) energy generation and distribution;
- (i) waste and sewage disposal; chemical treatment;
- (j) recreation; and
- (k) any other area which the Minister considers necessary for the purpose of listing.

(3) Despite any other law to the contrary, a person may not undertake a listed activity, unless the person is a holder of an environmental clearance certificate in relation to that activity.

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(4) Any person who contravenes subsection (3) commits an offence and is on conviction liable to a fine not exceeding N\$500 000 or to imprisonment for a period not exceeding 25 years or to both such fine and such imprisonment.

Exemption

28. The Minister may in a notice under section 27 make provision for the granting of an exemption in respect of an activity.

Provisions relating to listing of activities

29. (1) The Minister may amend the list referred to in section 27(1), by -

- (a) adding an activity to the list;
- (b) removing an activity from the list; or
- (c) making other changes to the particulars on the list;

(2) The Minister must comply with section 27(1) before amending the list referred to in that section.

(3) Any person may make representations to the Minister on the desirability of having an activity listed in terms of section 27(1) or delisted in terms of this section.

(4) The Minister is not bound by a representation made under subsection (3).

Procedure for identifying competent authorities

30. (1) Where no person or authority is, in terms of any other law, charged with the responsibility of granting authorisation in respect of a listed activity the Minister must in the notice under section 27(1) identify a person or authority who is responsible for granting authorisation in respect of that activity.

(2) The Minister or any other organ of state may under subsection (1) be identified as the competent authority.

(3) The Minister may agree with an organ of state that applications for environmental clearance certificates in respect of which the Minister is identified as the competent authority be dealt with by that organ of state.

Effect of authorisations under other laws

31. (1) Despite any other law to the contrary, a competent authority may not issue an authorisation unless the proponent has obtained an environmental clearance certificate in terms of this Act.

(2) An authorisation issued contrary to subsection (1) is invalid.

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ENVIRONMENTAL ASSESSMENT PROCESS****Application for environmental clearance certificate**

32. (1) A person who is required to obtain an environmental clearance certificate must, in the prescribed form and manner and on payment of the prescribed fee, apply to the relevant competent authority for an environmental clearance certificate in respect of the listed activity to be undertaken.

(2) The competent authority must in the prescribed manner forward the application referred to in subsection (1) to the Environmental Commissioner, if the proponent complies, in respect of the proposed activity, with any requirements prescribed by law in respect of that activity.

Registration of application and determining whether assessment is required

33. (1) When an application is made for an environmental clearance certificate, the Environmental Commissioner must -

- (a) register the application in the prescribed assessment register, and
- (b) within the prescribed time, decide whether the proposed activity requires an assessment.

(2) In making a decision in terms of subsection (1)(b), the Environmental Commissioner must -

- (a) follow the consultative process referred to in section 44; and
- (b) take into account -
 - (i) any comment received in terms of the consultative process;
 - (ii) the significant effect of the proposed activity on the environment;
 - (iii) the nature and extend of the proposed activity;
 - (iv) the principles set out in section 3; and
 - (v) any other matter that may be prescribed.

(3) A decision under subsection (1) does not exempt the proponent from complying with other requirements prescribed in respect of the proposed activity under any other law.

Procedure where assessment is not required

34. (1) Where the Environmental Commissioner has under section 33, decided that the proposed activity does not require an assessment the Environmental Commissioner may -

- (a) grant the application and, on payment of the prescribed fee, issue an environmental clearance certificate to the proponent; or

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(b) refuse the application and provide the proponent with reasons for the refusal.

(2) The Environmental Commissioner must within the prescribed time and in the prescribed form and manner -

(a) notify the proponent of the decision made in terms of subsection (1); and

(b) provide the proponent with the environmental clearance certificate, if issued.

(3) Any person who fails to comply with any condition attached to the environmental clearance certificate in terms of subsection (1) commits an offence and is on conviction liable to a fine not exceeding N\$500 000 or to imprisonment for a period not exceeding 25 years or to both such fine and such imprisonment.

Procedure where assessment is required

35. (1) Where the Environmental Commissioner has under section 33 decided that the proposed activity requires an assessment the Environmental Commissioner must -

(a) determine -

(i) the scope of the assessment; and

(ii) the procedures and methods for conducting the assessment;

(b) in the prescribed manner -

(i) notify the proponent that an assessment of the proposed activity is required to be carried out and prepared by the proponent, at the proponent's own expense, in accordance with the scope, procedures and methods determined under paragraph (a); and

(ii) state a reasonable period within which the assessment report must be submitted to the Environmental Commissioner.

(2) An assessment report must consist of the matters as prescribed.

(3) When determining the scope, procedures and methods of an assessment the Environmental Commissioner must follow the consultative process referred to in section 44.

(4) The Environmental Commissioner may vary the scope, procedures and methods determined under subsection (1)(a) -

(a) in accordance with modifications proposed by the proponent; or

(b) if the Environment Commissioner considers it necessary to complete an effective and timely assessment of the proposed activity.

(5) The Environmental Commissioner may, on application of the proponent and on good cause shown extend the period stipulated under subsection (1)(b)(ii) for the submission of the assessment report.

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(6) If, upon submission of the assessment report by the proponent, it appears to the Environmental Commissioner that the prescribed requirements in respect of the contents of the assessment report have been complied with the Environmental Commissioner must -

- (a) at the cost of the proponent, notify the application in the prescribed manner; or
- (b) direct the proponent to notify the application in the prescribed manner.

(7) A notification of an application under subsection (6) must -

- (a) contain the prescribed particulars in relation to the application;
- (b) state that the application and assessment report are available for inspection at the office of the Environmental Commissioner;
- (c) invite written submissions in relation to the application and assessment to be lodged with the Environmental Commissioner; and
- (d) specify the closing date for submissions.

(8) Where the proponent is directed under subsection (6)(b) to notify the application the proponent must furnish proof of the notification to the Environmental Commissioner as soon as is possible after the date of the publication of the notification.

Review

36. (1) Within a reasonable time after the closing date referred to in section 35(7)(c), the Environmental Commissioner must review the application and may take any action the Environmental Commissioner considers appropriate for the review of the application, including -

- (a) consulting any person, institution, or authority on any matter concerning the application, the assessment or any submission received in relation to the application;
- (b) carrying out, or appointing a person or a committee of persons to carry out, an investigation, including a process of public consultation, in relation to any matter concerning the application, the assessment or any submission; or
- (c) holding a public hearing.

(2) At least 14 days before the date fixed for the holding of a public hearing in accordance with subsection (1)(c), the Environmental Commissioner must give notice of the public hearing -

- (a) in the prescribed manner to the proponent;
- (b) in writing to every person from whom a submission in relation to the application has been received; and

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- (c) by publication of the notice in the prescribed manner.
- (3) The notice in terms of subsection (2) must -
 - (a) specify the date, time and place of the public hearing; and
 - (b) contain a brief description of the nature of the application.

Environmental Commissioner's decision

37. (1) After reviewing the assessment report in terms of section 36, the Environmental Commissioner may -

- (a) grant the application, and on payment of the prescribed fee, issue an environmental clearance certificate to the proponent; or
- (b) refuse the application and provide the proponent with reasons for the refusal.
- (2) The Environmental Commissioner must within the prescribed time and in the prescribed form and manner -
 - (c) notify the proponent of the decision made in terms of subsection (1); and
 - (d) provide the proponent with the environmental clearance certificate, if issued.

(3) Any person who fails to comply with any condition attached to an environmental clearance certificate in terms of subsection (1) commits an offence and is on conviction liable to a fine not exceeding N\$500 000 or to imprisonment for a period not exceeding 20 years or to both such fine and such imprisonment.

Record of decisions

38. (1) The Environmental Commissioner must, in accordance with subsection (2), keep a record of decisions made under sections 33, 34 and 37.

(2) The record of decisions must be kept in the prescribed form and must consist of information that may be prescribed.

(3) A copy of the record must be made available for public inspection at the office of the Environmental Commissioner during office hours.

Amending conditions of environmental clearance certificate

39. (1) The Environmental Commissioner may amend a condition of an environmental clearance certificate -

- (a) if the certificate holder consents to or requests for the amendment; or
- (b) at the initiative of the Environmental Commissioner, by giving written notice to the holder of the certificate.

(2) The Environmental Commissioner may require the holder of the environmental clearance certificate to make an application in the prescribed form and manner to the Environment Commissioner for the proposed amendment.

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(3) In considering an application to amend an environmental clearance certificate the Environmental Commissioner must have regard to the same matters which he or she was required to consider when deciding the initial application for that environmental clearance certificate.

(4) The Environmental Commissioner may only amend a condition of the environmental clearance certificate under this section if he or she is satisfied that the -

- (a) amendment will not have a significant effect on the environment; and
- (b) interests of any other person are not adversely affected.

(5) In amending an environmental clearance certificate the Environmental Commissioner must follow the consultative process referred to in section 44.

Duration of environmental clearance certificate

40. (1) An environmental clearance certificate becomes effective and operates from the date endorsed on the certificate.

(2) An environmental clearance certificate remains effective for a period not exceeding three years, subject to cancellation or suspension under section 42.

Prohibition on transfer of environmental clearance certificate

41. (1) A person may not transfer an environmental clearance certificate except with the permission of the Environmental Commissioner.

(2) An application for the transfer of an environmental clearance certificate must be made in the prescribed form and manner.

Suspension or cancellation of environmental clearance certificate

42. (1) Subject to subsection (3), the Environmental Commissioner may, by notice to the holder of the environmental clearance certificate suspend or cancel an environmental clearance certificate if the holder of the certificate -

- (a) has contravened any condition of the certificate;
- (b) has contravened this Act; or
- (c) is convicted of an offence in terms of this Act.

(2) An environmental clearance certificate may be suspended under subsection (1) -

- (a) for the period specified in the notice of suspension; or
- (b) until the Environmental Commissioner is satisfied that the person concerned has rectified the failure which led to the suspension.

(3) Except in a situation that the Minister considers to be an emergency that warrants action without notice to the holder of the environmental clearance certificate, the Minister may not suspend or cancel an environmental clearance certificate without first giving the holder an opportunity to be heard.

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(4) The Environmental Commissioner may, for good reason shown, reinstate an environmental clearance certificate cancelled or suspended under subsection (1).

(5) In suspending, canceling or reinstating an environmental clearance certificate in terms of this section, the Environmental Commissioner must follow the consultative process referred to in section 44.

Offences relating to this Part

43. (1) A person commits an offence, if the person -
- (a) alters or forges an environmental clearance certificate or any notice, order or document issued under this Part;
 - (b) knowingly gives false information in any application for an environmental clearance certificate made under this Part;
 - (c) without lawful excuse, fails or refuses to give data or information, or gives false or misleading data or information when required to give information in terms of this Part; or
 - (d) makes any false entry or declaration in any register, record or document required to be kept in terms of this Part.
- (2) A person convicted of an offence -
- (a) contemplated in subsection (1) is liable to a fine not exceeding N\$100 000 or imprisonment for a period not exceeding ten years or to both such fine and such imprisonment; and
 - (b) who after such conviction continues in the course of conduct which constituted such offence, commits a continuing offence and is liable to a fine not exceeding N\$10 000 or to imprisonment for a period not exceeding one year or to both such fine and such imprisonment in respect of every day on which he continues with the conduct.

PART IX**SPECIAL PROVISIONS RELATING TO ENVIRONMENTAL ASSESSMENTS****Consultation**

44. (1) When in terms of this Act the Minister or the Environmental Commissioner is required to consult, the Minister or the Environmental Commissioner, as the case may be -

- (a) must consult the organ of state whose area of responsibility may be affected by the performance of the function or duty or the exercise of the power; and
- (b) may, where appropriate, consult any other interested or affected person.

(2) When in terms of this Act the Minister or the Environmental Commissioner is required to consult any person or organ of state, such consultation is regarded as having been satisfied if a written notification of intention to act has been made to that person or organ of state and no response has been received within a reasonable time.

Act No. 7, 2007 ENVIRONMENTAL MANAGEMENT ACT, 2007**Appointment of external specialist**

45. The Environmental Commissioner may with the approval of the Minister appoint an external specialist reviewer and may recover costs from the proponent in instances where -

- (a) the technical knowledge required to review any aspect of an assessment is not readily available within the Ministry; or
- (b) a high level of objectivity is required which is not apparent in the documents submitted, in order to ascertain whether the information contained in such documents is adequate for decision-making.

Assessment costs may be recovered

46. The Environmental Commissioner may order the proponent to pay prescribed fees or charges for all or part of the costs that are incurred by or on behalf of the Ministry, as the case may be, in carrying out an assessment under this Act.

Access to environmental information

47. Organs of state are entitled to have access to prescribed environmental information held by any person where that information is necessary to enable such organs of state to perform their duties in terms of this Act or any other law concerned with the protection of the environment or the use of natural resources.

International environmental agreements

48. The Minister may introduce legislation in Parliament or make such regulations as may be necessary for giving effect to an international environmental agreement to which Namibia is a party, and such legislation and regulations may deal with the following -

- (a) the co-ordination of the implementation of the agreement;
- (b) the allocation of responsibilities in terms of the agreement, including those of other organs of state;
- (c) the gathering of information, including for the purposes of compiling and updating reports required in terms of the agreement and for submission to Parliament;
- (d) the dissemination of information related to the agreement and reports from international meetings;
- (e) initiatives and steps regarding research, education, training, awareness raising and capacity building;
- (f) ensuring public participation;
- (g) implementation of and compliance with the provisions of the agreement, including the creation of offences and the prescription of penalties where applicable; and

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- (h) any other matter necessary to give effect to the agreement.

PART X
GENERAL PROVISIONS

Delegation

49. (1) The Environmental Commissioner may delegate the exercise of any of his or her powers, and the performance of any of his or her duties or functions, to -

- (a) the holder of an office in the Ministry, who has the qualifications set out in section 16(1); or

- (b) an organ of state.

(2) A delegation referred to in subsection (1) -

- (a) must be in writing;

- (b) may be subject to conditions; and

- (c) does not prevent the exercise of the power or the performance of the duty by the Environmental Commissioner.

(3) The Environmental Commissioner may withdraw any delegation made in terms of subsection (1).

Appeals to Minister

50. (1) Any person aggrieved by a decision of the Environmental Commissioner in the exercise of any power in terms of this Act may appeal to the Minister against that decision.

(2) An appeal made under subsection (1), must be noted and must be dealt with in the prescribed form and manner.

(3) The Minister may consider and determine the appeal or may appoint an appeal panel consisting of persons who have knowledge of, and are experienced, in environmental matters to advise the Minister on the appeal.

(4) The Minister must consider the appeal made under subsection (1), and may confirm, set aside or vary the order or the decision or make any other appropriate order including an order that the prescribed fee paid by the appellant, or any part thereof, be refunded.

(5) Any expenditure resulting from the performance of duties by the appeal panel in terms of subsection (3) must be paid from the State Revenue Fund from moneys appropriated by Parliament for that purpose.

(6) An appeal made under subsection (1) does not suspend the operation or execution of the decision pending the decision of the Minister, unless the Minister, on the application of a party, directs otherwise.

Act No. 7, 2007 ENVIRONMENTAL MANAGEMENT ACT, 2007**Appeal to High Court against Minister's decision**

51. (1) Any person aggrieved by a decision of the Minister made in terms of section 50(4) or a decision under section 21 may appeal, on points of law only, against that decision to the High Court within the prescribed time and in the prescribed manner.

(2) The appeal must be proceeded with as if it were an appeal from a Magistrate's Court to a High Court.

Limitation of liability

52. The State or any other person is not liable for any damage or loss caused by -

- (a) the exercise of any power or the performance of any duty under this Act; or
- (b) the failure to exercise any power, or perform any function or duty under this Act,

unless the exercise of or failure to exercise the power, or performance or failure to perform the duty was unlawful, negligent or in bad faith.

Offence by a body corporate and jurisdiction

53. (1) If an offence under this Act which has been committed by a body corporate is proven to have been committed with the consent or connivance or, or to be attributable to any neglect on the part of -

- (a) any director, member, trustee, manager or other similar officer of the body corporate; or
- (b) any person who was purporting to act in the capacity of a director, member, trustee, manager or similar officer,

that person as well as the body corporate is deemed to have committed the offence and is liable to be proceeded against and punished accordingly.

(2) Despite any other law to the contrary, a magistrate's court has jurisdiction to impose any penalty provided for in terms of this Act.

Forfeiture and payment into Fund

54. (1) A court convicting a person of an offence under this Act may, in addition to any penalty imposed in respect of that offence -

- (a) order that the any equipment, record, register, document or any other material object that was used for the purpose of or in connection with the commission of the offence be forfeited to the State; and
- (b) summarily enquire into and assess the monetary value of any advantage gained or likely to be gained by that person in consequence of that offence and impose on that person a fine to a maximum equal to the monetary value so assessed or, in default of payment of the fine, to imprisonment for a period not exceeding one year.

Act No. 7, 2007 ENVIRONMENTAL MANAGEMENT ACT, 2007

(2) Section 35 of the Criminal Procedure Act applies with necessary changes to a forfeiture under subsection (1).

(3) Money received as payment of a penalty following a conviction in terms of this Act, or the proceeds from the sale of anything declared forfeited in terms of section 35 of the Criminal Procedure Act following a conviction in terms of this Act, or any fee or charge payable in terms of this Act, must be paid into the Fund.

Act to bind State

55. This Act binds the State.

Regulations

56. (1) The Minister may make regulations relating to -
- (a) the disposal of certain types of waste;
 - (b) the granting of exemption from any provision of this Act and the conditions subject to which such exemption may be granted;
 - (c) the requirements for listing or delisting of activities in terms of section 27 or 29;
 - (d) what constitutes an activity for purposes of listing or delisting in terms of section 27 or 29, and for that purpose the Minister may -
 - (i) categorise activities according to size, production or storage capacity, timing, geographical location, potential for significant effects, type of industry to which the activities are related, type of proponent or on any other basis that the Minister considers appropriate, and
 - (ii) provide differently for the different categories of activities;
 - (e) the form and content of an application, for an environmental clearance certificate, the transfer, amendment or renewal of the certificate;
 - (f) the form and content of a register, record or any other document required to be kept under this Act;
 - (g) fees payable for any application made in terms of this Act and the manner of payment of fees;
 - (h) fees payable for request for records and other information kept in terms of this Act;
 - (i) the assessment process;
 - (j) the content of an assessment report;
 - (k) the procedure and time limits within which organs of state must do anything required to be done in terms of this Act;

Act No. 7, 2007 ENVIRONMENTAL MANAGEMENT ACT, 2007

- (l) time limits not otherwise provided for under this Act for things required or permitted to be done under this Act, which time limits may differ for different categories of projects, events or circumstances;
- (m) the manner and form for delivering or a document or for giving notice under this Act;
- (n) any matter which in terms of this Act is required or permitted to be prescribed; and
- (o) generally any other matter in respect of which it is necessary or expedient to make regulations in order to achieve the object of this Act.

(2) A regulation made under subsection (1) may prescribe a penalty for any contravention of, or failure to comply with any provision thereof, not exceeding a fine of N\$100 000 or imprisonment for a period not exceeding 10 years or to both such fine and such imprisonment.

Existing authorisation

57. (1) A person who, on the date of commencement of this Act, undertakes a listed activity under an authorisation may continue to undertake such activity for a period not exceeding one year, or such longer period as the Minister may on application approve.

(2) A person who wishes to continue with a listed activity in terms of an authorisation contemplated in subsection (1) after its expiry in terms of that subsection must apply for an environmental clearance certificate, in terms of this Act before its expiry.

(3) If a person has lodged an application in terms of subsection (2) the relevant authorisation in respect of which the application has been lodged remains valid until such time as the application has been dealt with in terms of this Act.

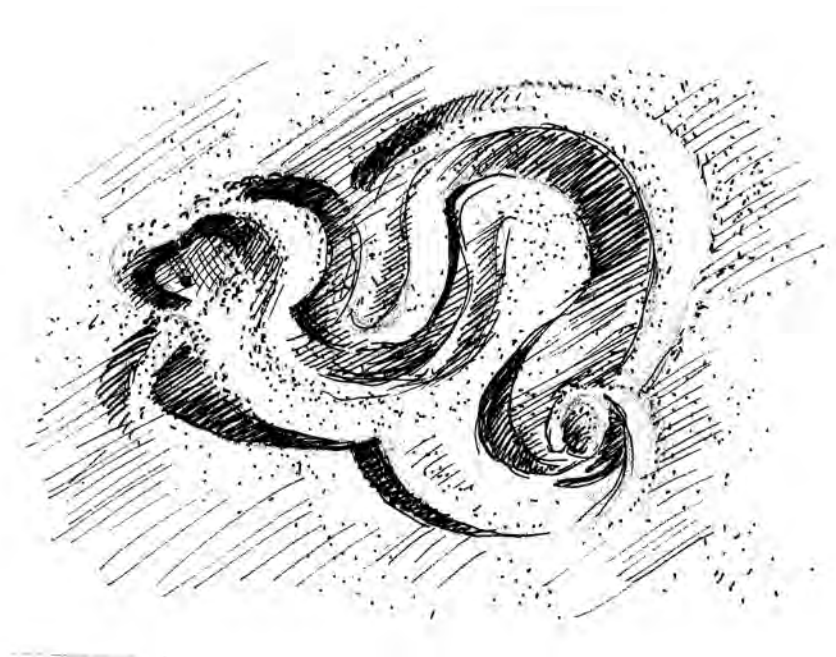
Short title and commencement

58. (1) This Act is called the Environmental Management Act, 2007, and commences on a date determined by the Minister by notice in the *Gazette*.

(2) Different dates may be determined under subsection (1) in respect of different provisions of this Act.

Annex 20

Management Plan for Namib-Naukluft Park





Draft

(for discussion only - not to be quoted)

**Management & Development
Plan for the
*Namib-Naukluft Area of the
Namib-Skeleton Coast National
Park***

For the Period of 2009-2013

First draft: 8 January 2009

Second draft: February 2009

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Abbreviations

BCLME - Benguela Current Large Marine Ecosystem
CA - Central Area
CEO - Chief Executive Officer
CF - Consultative Forum
DEA - Directorate of Environmental Affairs (in MET)
EIA - Environmental Impact Assessment
EMP - Environmental Management Plan
HQ - Headquarters
HW - Honorary warden
IBA - Important Bird Area
IPA - Important Plant Area
IUCN - World Conservation Union
KBA - Key Biodiversity Area
LA - Local Authority
MDP - Management and Development Plan
MET - Ministry of Environment and Tourism
MFMR - Ministry of Fisheries and Marine Resources
NAMPORT - Namibian Port Authority
NAMPOL - Namibian Police
NGO - Non Governmental Organisation
NNA - Namib-Naukluft Area
NSCNP - Namib Skeleton Coast National Park
ORV - Offroad Vehicle
TORs - Terms of Reference
SA - Sperrgebiet Area
SEA - Strategic Environmental Assessment
SF - Strategic Forum

Overview of the Namib Skeleton Coast National Park

The Namib-Skeleton Coast National Park (hereafter NSCNP) stretches along the entire Namibian coastline, a distance of about 1,570 km, from the Orange River in the south to the Kunene River in the north (Figure 1). It comprises four main Management Areas, the "Sperrgebiet" (name under review) in the south, the Namib-Naukluft, the Central Area and the Skeleton Coast. At its narrowest point in the Skeleton Coast, the Park extends about 25 km inland, while at its widest in the Naukluft area it extends inland about 180 km to the top of the escarpment. Namibia is the only continental country in the world that has its entire coastline protected as a national park.

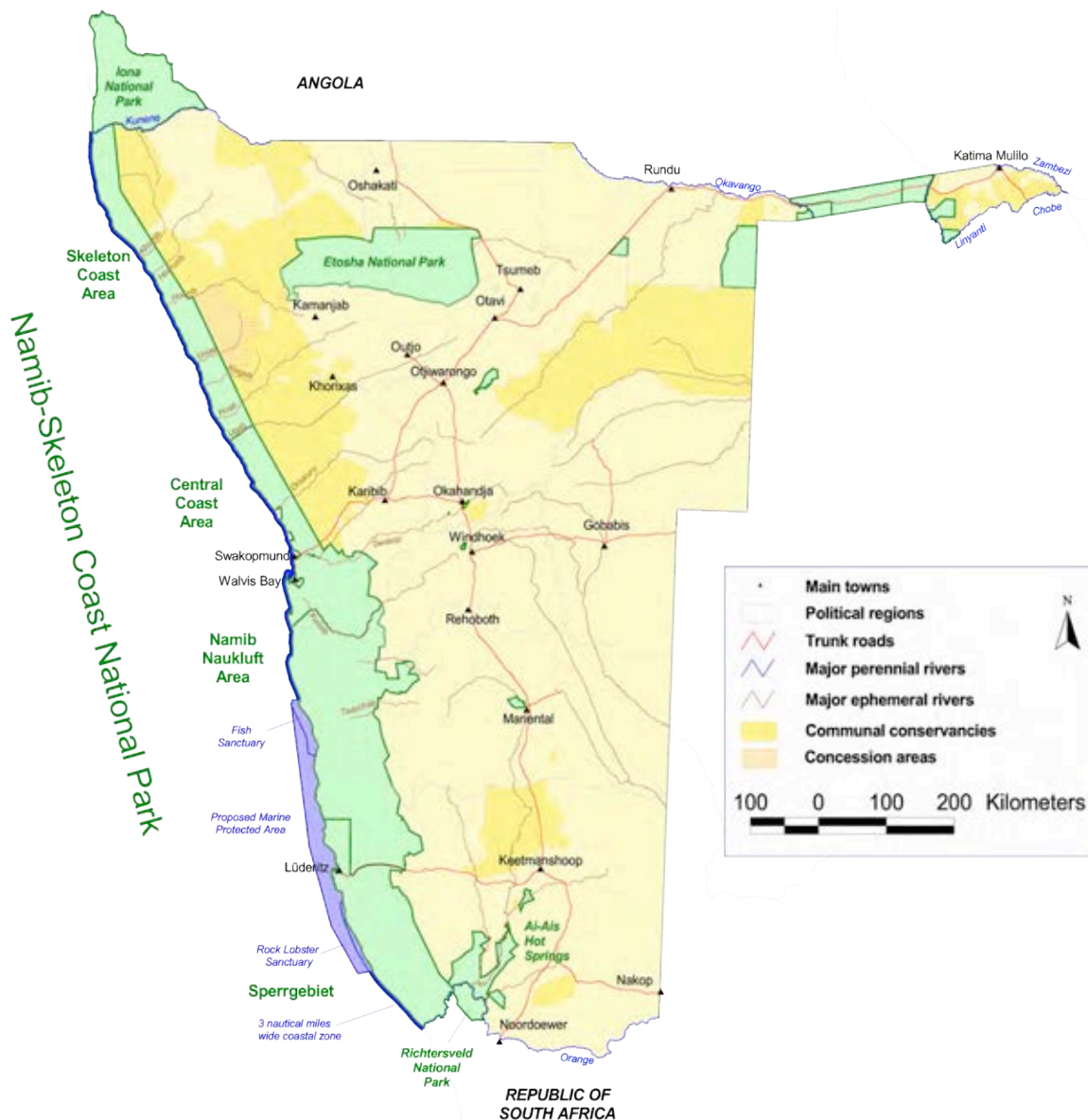


Figure 1: The Namib-Skeleton Coast National Park showing the four Management Areas, the proposed Marine Protected Area and the contiguous areas of land under different forms of conservation (e.g. National Parks in Angola, Namibia and South Africa, communal Conservancies and wildlife & tourism Concessions).

The NSCNP is the 8th largest protected area in the world, the 6th largest terrestrial protected area globally and the largest park in Africa (see Table 1), covering an area of 10.754 million hectares, or 107,540 km².

Table 1: The 10 largest protected areas in the world.

No.	Name	Ecosystem	Country	Size (ha)
1	Greenland's National Park	Terrestrial and coastal; Arctic island	Greenland	97,200,000
2	Ar-Rub'al-Khali Wildlife Management Area	Terrestrial; Desert	Saudi Arabia	64,000,000
3	Great Barrier Reef Marine Park	Marine & coastal	Australia	34,500,000
4	Northwestern Hawaiian Islands' Coral Reef Ecosystem Reserve	Marine & coastal	United States of America	34,000,000
5	Amazonia Forest Reserve	Terrestrial; Tropical rain forest	Colombia	32,000,000
6	Qiang Tang Nature Reserve	Terrestrial; Alpine Tibetan plateau grasslands	China	25,000,000
7	Cape Churchill Wildlife Management Area	Terrestrial; intertidal & marine	Canada	14,000,000
8	Namib-Skeleton Coast National Park	Terrestrial & coastal; Desert ecosystems	Namibia	10,754,000
9	Northern Wildlife Management Zone	Terrestrial; Desert	Saudi Arabia	10,000,000
10	Alto Orinoco-Casiquiare Biosphere Reserve	Terrestrial; tropical rain forest	Venezuela and Bolivia	8,000,000

However, the NSCNP does not exist in isolation. In the south across the Orange River it borders on the Richtersveld in South Africa, which comprises a protected area of about 160,000 ha within a multiple use buffer zone of about 398,425 ha. This whole area forms the Ai-Ais/Richtersveld Transfrontier Conservation Area (TFCA) under a formal cooperative Agreement between the Governments of Namibia and South Africa.

To the north across the Kunene River it joins the Iona National Park in Angola, which covers about 585,000 ha. The Governments of Namibia and Angola have signed an Agreement to promote transfrontier cooperation between these parks.

In Namibia the NSCNP is contiguous with a large number of protected areas, concessions, conservancies and private land managed for conservation. These are shown in Table 2. Most notable amongst these are the following:

- Coastal and Marine Protected Area off the Sperrgebiet and Namib-Naukluft areas, running for 400 km up the coast and about 30 km wide, covering an area of 1.2 million ha and containing all of Namibia's islands;
- Ai-Ais/Fish River Canyon National Park which in turn borders on private protected areas;
- Contiguous with 20 communal conservancies and three wildlife and tourism concession areas, and via them linked to the Etosha National Park (2.29 million ha) and thence to further communal and private conservation areas;
- Borders on at least 2 million ha of freehold conservancies and private protected areas.

Table 2: Contiguous conservation areas with the NSCNP

Country	Name / Tenure	Area (ha)
South Africa	Richtersveld and buffer area / communal (RSA Parks)	558,425
Angola	Iona National Park / state	585,000
Namibia	Communal conservancies	6,235,500
	Wildlife & tourism Concessions	800,000
	Freehold conservancies and private protected areas	2,050,000
	State Parks (Ministry of Environment & Tourism)	2,651,200
	Marine Protected Area (Ministry of Fisheries & Marine Resources)	1,200,000
TOTAL		14,080,125

(Note that the extent of land under conservation, particularly private land, is constantly changing (increasing) and that, because there is no registration mechanism for private protected areas and game farms, this figure represents an absolute minimum area.)

In total the NSCNP borders onto over 14 million ha of land and sea that is managed primarily for wildlife, biodiversity, conservation and tourism. Together with the NSCNP, this represents a contiguous area of almost 25 million ha. One of the greatest challenges with potentially the greatest rewards is to develop effective, constructive and efficient co-management mechanisms across these land- and seascapes to optimize both the environmental (including biodiversity) and socio-economic values, while at the same time using these open systems to (a) allow the historic movement and migration patterns of wildlife in response to the highly variable climatic conditions to become reestablished, (b) mitigate and buffer the impacts of climate change and thereby make the area more resilient to change, and (c) create incentives for neighbouring land owners and custodians to become part of this conservation landscape, thereby further strengthening the area's contributions to socio-economic development and environmental conservation.

The proclamation of this protected area represents one of Namibia's greatest conservation achievements since gaining Independence in 1990, and one of the most exciting developments in the history of conservation in this country.

The NSCNP occupies the most arid lands in Africa south of the Sahara. Apart from the eastern edge of the Naukluft, the whole park falls below the 100 mm median annual rainfall isohyet and over 60% of the land area of the park falling below the 50 mm isohyet. In addition to the extremely low annual rainfall it is also hugely variable with an annual coefficient of variation ranging typically from 80% to over 100%. With its high evaporation rates and low rainfall, the NSCNP experiences an average water deficit of about 2 m per year. In the north and central areas rain falls mainly in January to March, while in the Sperrgebiet rainfall is about equally unlikely in all months of the year. The fact that some rain falls in the winter months, derived from frontal weather passing the Cape, results in the succulent vegetation of this area.

The climate of the NSCNP is influenced mainly by the cold Benguela Current and the South Atlantic Anticyclone. Temperatures are generally moderate (average minimum and maximum temperatures during the coldest and hottest months respectively reflecting a range of about 7-32°C), fog is frequent (about 125 days per year on the coast dropping to about 40 days per year 80 km inland) and wind is a dominant feature. The southern part of the coast is a particularly high wind energy area, especially in the summer months with average daily speeds of over 40 km/h. These winds are mainly from the south and drive the Benguela Current northwards, carry sand from the shore into the adjacent land, particularly into the southern dune fields, and cause upwellings along the coast which bring nutrient-rich water to the surfaces.

It is important to understand why the Namib is a desert. First, the cold waters of the Benguela Current cool the air so much that it cannot rise up and develop into large rain-bearing clouds. The sea air remains trapped in a layer from the sea to about 600 m above sea level. Moisture from the sea is seen only as low clouds and fog. Second, moist tropical air from the east and north has usually shed its moisture before reaching the Namib coastal areas. And even when rain-bearing clouds do approach, they are usually blocked by breezes from the sea which blow inland for some distance, often to the escarpment. And finally, any moist tropical air blowing towards the desert descends over the escarpment, warming and drying out as it sinks down. These factors all combine to make rainfall an unusual event in the NSCNP.

The NSCNP covers the coastal biome and three terrestrial biomes, namely the hyper-arid Namib Desert, the Nama Karoo and the Succulent Karoo. The amount of each of these terrestrial biomes protected by the Park is shown in Table 3. These biomes contain a number of different vegetation types and an even greater number of habitats.

The geology of the NSCNP ranges from the oldest rocks known, the Vioolsdrift Granite Suite and the Haib Group (2,600 - 1,650 million years ago) in the south of the Sperrgebiet, to the youngest geology comprising the Namib Sands (70 million years old to present) which dominate the central Namib sand sea and large parts of the Sperrgebiet.

Table 3: Percentage of each biome contained within the NSP and within immediately contiguous conservation areas.

Biome	Percentage (%) of biome					Total
	NSCNP	Communal Conservancies	Concessions	Freehold land	Other State Parks	
Namib Desert	76	14	3	2	0	95
Nama Karoo	3	13	1	4	2	23
Succulent Karoo	85	0	0	1	5	91
Coastal	99	0	0	0	0	99

The NSCNP contains a large number of globally significant features. The following are perhaps the most notable:

- A global biodiversity hotspot comprising the Sperrgebiet, the most diverse desert in the world. Nearly 25% of Namibia's plant species (over 1,050 species) occur here, on less than 3% of its land surface, many of them endemic to the area and highly range restricted.
- Three Ramsar sites, being Walvis Bay, Sandwich Harbour and the Orange River Mouth, this last being a joint site between Namibia and South Africa.
- Eight Important Bird Areas (IBA), being Cunene River Mouth, Cape Cross Lagoon, Namib-Naukluft Park, Mile 4 Saltworks, 30 km Beach (Walvis Bay to Swakopmund), Walvis Bay, Sandwich Harbour and the Sperrgebiet. In addition, there are four IBAs covering islands immediately off the Namib-Naukluft and Sperrgebiet Areas and within the Marine protected area, namely Mercury Island, Ichaboe Island, Lüderitz Bay Islands and Possession Island.
- Two Important Plant Areas (IPA), being the Lichen fields in the Central Coastal Area and the Sperrgebiet. Additional IPAs occur immediately to the east of the Sperrgebiet and contiguous with it, and linking it to the Ai-Ais / Huns Mountains / Fish River Canyon complex, and to the east of the Skeleton Coast Area and northern parts of the Central Coastal Area, incorporating the entire northern escarpment zone and linking to the Etosha National Park.
- All the IPAs and IBAs also qualify as Key Biodiversity Areas, sites of global significance for biodiversity conservation, and using globally standard criteria and thresholds.
- The only two perennial rivers crossing the Namib form the northern (Kunene River) and southern (Orange-Gariep-Senqu River) borders of the

NSCNP respectively. In addition, 12 significant ephemeral river systems drain westwards across the Park. Of these, the flows of two rivers are stopped by the Namib Sand Sea where they form pans surrounded by sand dunes (Tsondabvlei and Sossusvlei).

- The NSCNP contains a huge diversity of desert landscapes and scenery, habitats, biodiversity and, despite its fragility, a large number of economic opportunities if carefully planned and managed. The Northern Namib comprises large mountainous areas with incised river systems that support some of Africa's most charismatic megafauna such as desert-adapted elephants, rhino, giraffe, lion, leopard and cheetah, made all the more remarkable by their presence in this hyper-arid zone and desert scenery. The Central Namib contains huge vistas over mainly gravel plains with insulbergs, that support the plains game such as oryx, springbok and ostrich. The Southern Namib contains Namibia's sand sea, an area of some 4 million ha of sand dunes and ridges, giving way to the escarpment in the east and some of the most dramatic scenery at Sossusvlei and in the Naukluft. And finally, the Sperrgebiet, with its 100 year history of diamond mining and exclusion, with rich archaeological, paleontological, historic and biodiversity values and a dramatic coastline. This diversity offers huge potential for tourism routes from the south to the north, within Namibia's desert biomes, both within and adjacent to the NSCNP.
- Contiguous with the south-eastern point of the Sperrgebiet is the Ai-Ais National Park which contains the Fish River Canyon, the second largest Canyon in the world after the Grand Canyon in the USA.
- The western border of the NSCNP is on the coast, 25% of which is designated as Namibia's first coastal and marine Park. This enigmatic and poignant coast - the Coast of Skeletons - contains many shipwrecks, the bones of early mariners as well as those of whales and seals.
- The Park's northern border is shared with the Iona National Park in Angola, while areas on its southern border in South Africa are being developed under conservancy type approaches. The western border of the Park is shared with communal lands (about 54%), freehold lands (about 45%) and the Ai-Ais National Park (<1%). Almost 100% of the Park's border with communal lands comprises conservancies and wildlife and tourism concessions. At least 60% of the freehold bordering land comprises private parks and land managed for wildlife and tourism. This means that over 80% of the NSCNP's western border is shared with neighbours practicing land uses that are both friendly and compatible to that of the Park. This offers huge opportunities for partnership and co-management.

With these and many other attributes of the NSCNP and its adjacent areas, serious consideration should be given to seeking World Heritage Site status for the entire region (the NSCNP and selected areas adjacent to the Park). This

would hugely increase its marketability and also assist with its management, without forfeiting any of the options that are currently, or may n future, become available.

Authority of the Management & Development Plan

This Management & Development Plan (MDP) for the Namib-Naukluft Area (NNA) of the Namib-Skeleton Coast National Park (NSCNP) sets out the vision, objectives and guidelines for the management and development of this Area of the Park. As such, it represents the policies and intentions of the Ministry of Environment and Tourism (MET), the Ministry of Fisheries and Marine Resources (MFMR) and their partners. The MDP and its accompanying regulations are accepted as the ultimate authority for the Park. All involved with the Park, including MET and MFMR decision-makers and management staff, personnel of other Ministries and Parastatals, private sector companies and individuals, all contractors, partners, neighbours, tourists and any entity and individual dealing in any way with the park, must ensure that all actions and decisions relating to the park are in strict accordance with these documents.

Senior staff appointed to run the park, i.e. the Area Warden and his/her MFMR counterpart(s), are ultimately responsible for ensuring that the MDP is implemented in effective and efficient ways, and that the regulations are enforced. S/he is also responsible for ensuring effective day-to-day management, dynamic, responsive and pro-active rolling planning as well as contributing to longer-term planning.

This MDP (2009-2014) will be thoroughly reviewed and, where necessary, revised, every five years. The next review should be done in 2013/14 for implementation in 2014. Any changes that must be made in the interim to Parts 1-4 and 7 must be recommended by the NNA's Consultative Forum (CF) and approved by the Strategic Forum (SF), and be reflected in the respective minutes by means of a signed and dated amendment. These approved changes must be appended to the master copies of the MDP, four held within the NNA (MET Ganab, MET Zais, MET Escourt and MET Sesriem), copies held in adjacent Park Areas (CA Walvis Bay, Swakopmund and Gobabeb, SA Luderitz and Aus), another held at the Office of the Chief Executive Officer of the Namib-Skeleton Coast National Park, three held in MET Head Office in Windhoek (Deputy Director and Director of Parks & Wildlife and the Office of the Permanent Secretary), copies held by MFMR Swakopmund, Walvis Bay and Luderitz, and by the Director of Fisheries in Windhoek. Changes may be made to Parts 5 & 6, with the joint approval of the Park CEO, the Directors of Parks & Wildlife and Fisheries respectively, as new information becomes available.

The MDP must be viewed as a valuable and central document by all management- and policy-level staff and stakeholders involved with the NNA. They should be familiar with its contents, and should make use of it to familiarize new staff with the vision, aims, objectives and policies of the Area and Park.

It is part of every MET and MFMR staff member's job and stakeholder's responsibility to help implement this MDP. It is also every staff member's and stakeholder's responsibility to propose improvements to the plan, as well as improvements in how the plan may be implemented. Park management is a team effort that cuts across all sectors. The future well-being and development of the NNA and the Namib-Skeleton Coast National Park depends on this team approach.

.....
Director: Parks & Wildlife, MET

Windhoek, date:.....

.....
Permanent Secretary, MET

Windhoek, date:.....

.....
Minister: MET

Windhoek, date:.....

.....
Director: Fisheries, MFMR

Windhoek, date:.....

.....
Permanent Secretary, MFMR

Windhoek, date:.....

.....
Minister: MFMR

Windhoek, date:.....

Philosophy of approach

The plan for this Park has been designed and structured to be priority focused and action orientated, to facilitate implementation and the achievement of outputs and outcomes. The plan is linked to an annual cycle of management and oversight, involving the preparation of annual work plans, budgets, reporting and two levels of Area oversight - a Strategic Forum and a Consultative Forum.

The plan is "principles" based. These principles serve essentially as mini policy statements. Not all eventualities can be planned for, but if the basic principles are established, decisions can be readily made against these principles and thus be in line with Area and Park policy.

The plan is designed around a uniform structure for easy reference and use, and the language (apart from some basic technical terms used in the conservation sector) is kept simple for broad accessibility.

The plan should be used in conjunction with Area and Park legislation and regulations, as well as with other relevant literature on the area. No superfluous or duplicate information is provided in the plan. A reference list of the more significant publications and reports on the area is contained in Part 6.

The Plan was developed in a highly participatory, bottom-up way. The following steps were followed:

- An initial brainstorming meeting was held with MET Parks & Wildlife Director, MFMR officials and the Chief Wardens of the coastal Parks to identify key issues.
- A recent previous Namib-Naukluft Park Management Plan had been developed, after extensive consultations with MET field and head office staff and other key stakeholders. This work was used as a basis for the present MDP.
- Follow-up consultations were held with MET staff to clarify details.
- A two day public workshop was held in Swakopmund for all stakeholders to (a) explain and discuss the process and (b) identify key issues.
- Two public meetings were held to discuss the outcomes of the workshop and receive further inputs, in Swakopmund and Windhoek.
- A 1st draft of the MDP was prepared. This was distributed to all stakeholders involved in the workshop and meetings, and placed on a public website. Information on this website was published in the media and distributed by e-mail. All interested and affected parties were invited to

review the draft MDP and provide comments - a review period of 4 weeks was provided.

- Based on some minor suggestions, a 2nd draft of the MDP was prepared and placed on the website. This was presented to a technical meeting of senior MET and MFMR staff in Windhoek.
- Regulations have been written and distributed for comment
- A second MET and MFMR meeting for senior management, chaired by the Permanent Secretary, was held to review the 3rd draft. A number of minor comments were made, which have been incorporated into this final draft. The following key next steps emerged:
 - Develop as a separate companion document, the ideal staffing arrangements for the whole Namib-Skeleton Coast National Park which addresses the needs of each Management Area, including *inter alia* posts, categories, task descriptions, location - all personalized to the specific requirements of the Areas and Park and for the implementation of the Area MDPs that make up Park management. Adopt a fresh approach to support Information, Extension and Environmental Education, Monitoring, Citizen liaison, inter-sectoral collaboration - and adopt an efficient business-outputs staffing approach with a Park CEO and sufficiently senior staffing at Area level;
 - Develop as separate companion documents, a detailed Tourism Development Plan (see appendix A for initial ideas) and a Park Business Plan, each designed to be operational at Area level as well as at Park and greater landscape levels.
- Circulate this 3rd draft of the MDP formally to key line ministries for comment (MFMR, MRLGHRD, MLR, MME, MWT), to the Erongo Regional Council, the town Councils of Walvis Bay and Swakopmund, the Topnaar Community, the local Chamber of Commerce & Industry, FENATA, the Fishing industry, Salt Mining Company, TransNamib, NamPower, etc.
- Comments received will be considered and a final draft of the Management & Development Plan will be prepared and formally adopted and signed off by MET and MFMR.
- The approved Management & Development Plan for the NNA of the Namib-Skeleton Coast National Park will be distributed as a public document and made widely available to all relevant stakeholders, partners and interested and affected parties. It was also provided to the EIA Unit of the DEA/MET.

Management system

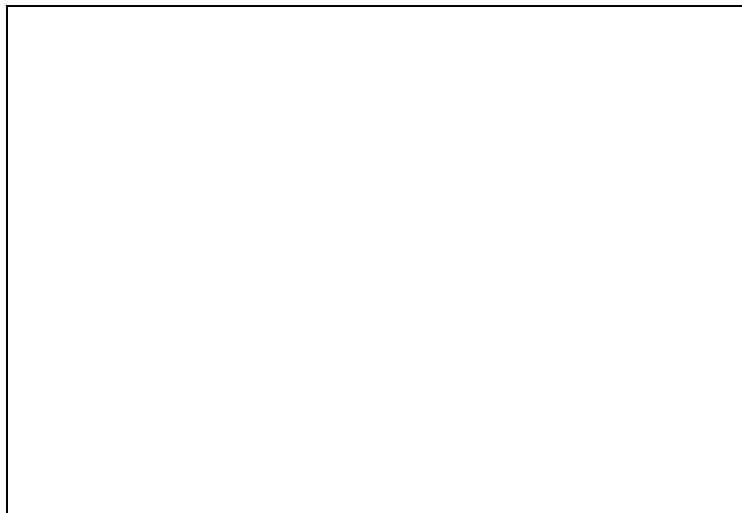
The MDP must be implemented in an efficient and systematic way. For each annual cycle, an *Annual Work plan* and a *Budget* will be prepared. This work plan will, as far as practical, follow the sequence of topics listed under parts 3 & 4 in the Plan.

The work plan should cover:

- **Routine management issues**, such as managing water points, law enforcement, extension work, etc.
- **Development issues**, such as tourism developments, wildlife reintroductions, etc.
- **Monitoring activities**, to systematically and opportunistically collect information, store, enter into database, analyse and interpret information for adaptive management, covering such things as key biodiversity indicators, tourism and industrial impacts, etc.
- **Research needs**, based on the identification of priority information and knowledge gaps, with appropriate ways of implementing such research.
- **Administration**, including work plan & budget preparation, reporting and meetings.

Progress on the implementation of the annual work plan and a financial report against the approved budget should be presented at each **Consultative Forum** meeting. These will be standing agenda items, and the reporting format should follow the sequence of issues and timing of the work plan.

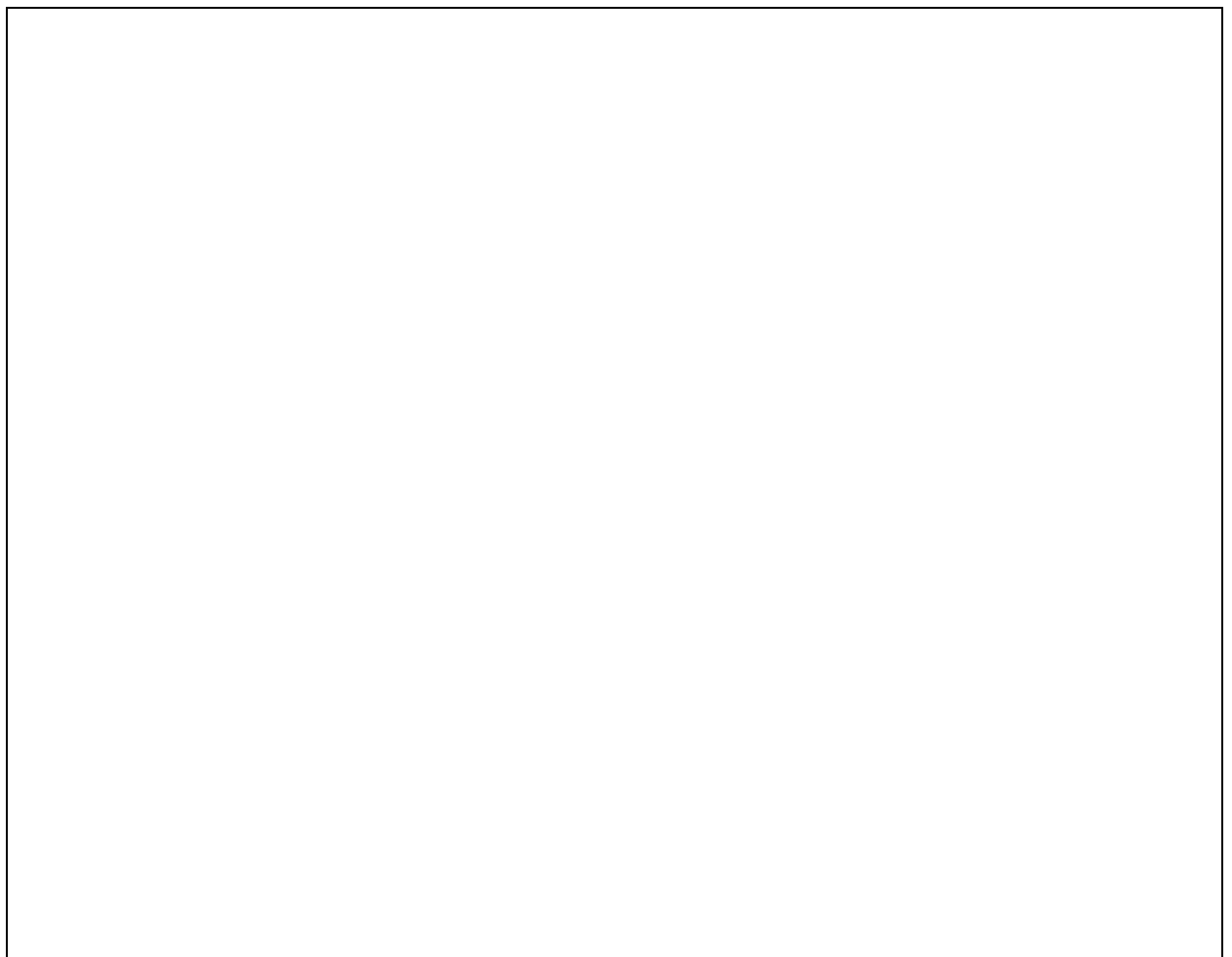
At the end of each annual cycle, an *Annual Report* and *Financial Report* will be prepared, plus a draft work plan and budget for the following year. The Annual Report will use the format of the work plan, and include cumulative (time-series) information from the monitoring programme. The cumulative information, showing trends over time, will be used to adaptively manage the Area. This information will also be used, together with the direction provided by the MDP, to prepare the next Annual Work Plan and Budget, both of which, together with the past years technical and financial reports, will be tabled for review and adoption by the **Strategic Forum**.



Institutional arrangements

Because the Park consists of marine and terrestrial components, the intertidal coastal zone, its biota and the species that transcend the marine / terrestrial interface are managed jointly by the MET and MFMR under agreed co-management principles and protocols that promote synergy, efficiency and elevated conservation management, monitoring and protection of habitats, processes and species. The intertidal co-management approach is a model of collaboration with clear benefits to the ecosystem and responsible institutions. Moreover, the two ministries shall jointly appoint Honorary Wardens who will assist with monitoring, surveillance, information dissemination, stakeholder engagement and law enforcement.

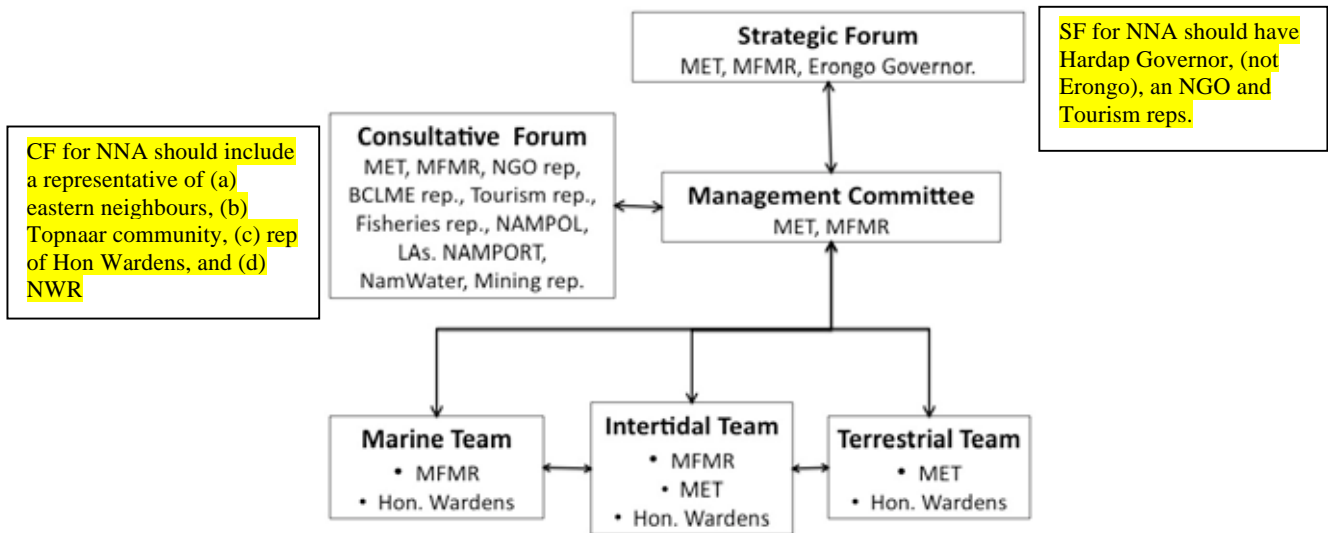
The proposed MET staff structure for the SCNP appears below.



The proposed MFMR staff structure for the SCNP appears below.

To follow

The management and decision making structure for the NNA is as follows:



The **Strategic Forum** shall meet once a year, with the three institutions represented by Minister and Permanent Secretary level, and the Hardap Region represented by the Governor and appropriate Councilors. The NGO sector shall select a person familiar with ecosystems, biodiversity, conservation and socio-economic issues of the NNA, while FENATA shall select an appropriate representative for tourism issues.

The SF will review and accept/reject/require changes to the Area's Annual Report and next years Work Plan, Budget and proposed amendments to the Management and Development Plan, all of which shall be delivered by the Management Committee. The Management Committee shall also serve as the secretariat of the SF, produce the agenda a month before the meeting and the minutes within one month of the meeting having taken place.

The **Consultative Forum** will play an advisory role, and should meet at least four times each year. Its membership is suggested in the organogram above, but this can be an inclusive structure that welcomes newcomers who may have insights and something to offer to this Area of the Park in terms of ideas and support. This CF is the Area's formal mechanism for consulting with key stakeholders and building an all-inclusive team approach towards park management and development. It

also promotes a broad-based feeling of ownership about the Area and Park. The main purpose of CF meetings is to track progress towards meeting set objectives (e.g. annual work plan), solving problems, mobilizing skills and energy from stakeholders and partners to help manage and develop the NNA, and capitalizing on opportunities that may arise.

At the CF meetings, the representatives will work through the key objectives and activities of the Annual Work Plan, brief each other on their activities and plans, and exchange views on how best their respective sector interests might be accommodated in the Area and Park, and how they may contribute to its management and development. The Management Committee should 'bounce ideas' off the CF and their advice should be carefully considered. The Management Committee shall serve as the secretariat of the CF, produce the agenda a month before the meeting and the minutes within one month of the meeting having taken place. Minutes of all CF meetings must be copied to the SF for their information.

The Management Committee is responsible for operational decision-making, and it shall consist of senior staff from MET and MFMR. Both ministries should include law enforcement, resource management and scientific services personnel on their teams. This committee must meet monthly so that the co-management institutions are regularly in contact with each other, and it must strive to achieve integrated management, avoiding wherever possible sectoral conflicts and unnecessary 'turf wars' - their responsibility is **co-management**. The chairperson of the meetings shall rotate every year, with the institution chairing providing the secretariat. Minutes of all MC meetings must be copied to the CF and SF for their information.

Given the specific national mandates for MET and MFMR, it is logical that the former will handle management on land (above high water mark) while the latter will manage the ocean component (below low water mark). The intertidal zone will require shared management on a roughly equal basis, depending on availability of personnel and other resources. It is important that there is complimentary between these institutions, NOT duplication and NOT competition. Suitably qualified MET personnel shall be empowered to enforce fisheries legislation, and suitably qualified MFMR personnel shall be empowered to enforce environmental, park and conservation legislation.

The **Honorary Wardens** (HWs) are an important component of the team, and the target should be 40 for the NNA, covering conservation, recreation and tourism, resource use, business and development components and neighbours . The HWs should be present/active in various locations in and neighbouring the NNA.

The HWs must receive appropriate training and be appointed for three years, renewable for further 3-years terms depending on their performance and commitment. The criteria for their selection include:

- Commitment to the conservation and management of the Park, and to assist the authorities in the implementation of this Management and Development Plan.
- Knowledge of the coastal, desert, escarpment and/or marine environments.
- Knowledge of the law and successful completion of the required training.
- Integrity and good standing in society (law abiding and no criminal record).
- Presence in or adjacent to the area (regular traveler through the area, along its boundary, etc).
- Own transport (car, quad-bike, boat, aircraft, bicycle), communication means (e.g. cell phone), positioning equipment (e.g. GPS), digital camera and willingness to use them for the good of the Area and Park.
- Ability to deal with people firmly but fairly, including law-breakers.
- Team player.

The Honorary Wardens shall have the following powers:

- To provide information on the MDP, zonation and regulations of the NNA and on the Namib-Skeleton Coast National Park.
- To inform people who break the law that they are in contravention of the above, and request them to immediately comply.
- To stop a person and search a vehicle, boat or aircraft, providing there is a reasonable suspicion that the person has been involved in an illegal activity.
- To demand a persons name (as above).

- To inspect a suspects luggage (in search of any illegal items, such as fish, shellfish, bait, venison, live animals, plants, etc.).
- To count and/or measure fish or shellfish to determine if they comply with legal requirements.
- To confiscate any items found to be illegal - and to then issue a confiscation receipt to the offender and to store the confiscated items in a safe place.
- To issue an offender with an official warning.
- To report an offender to the authorized law enforcement agencies, whose task it is to perform an arrest/fine as the case may be.

Actions	Timing	Record of progress
1. Establish the Strategic Forum and agree on their TORs	Mid 2009	
2. Establish the Management Committee and agree on their TORs	mid 2009	
3. Establish the Consultative Form and agree on their TORs	mid 2009	
4. Prioritise areas, issues, species requiring co-management approaches, and agree on areas, issue, species that should rather be managed sectorally	End 2009	
5. Establish practical and efficient operating procedures for collaboration, communication and reporting.	mid 2009	
6. Through the offices of the PS of the two ministries, appoint Honorary Park Wardens, provide them with TORs and relevant training and issue them with IDs, operating procedures and warning and confiscation books.	End 2009	

Notes:

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Part 1: Vision, Goal and Objectives

1.1 Vision

To develop the NNA, as a world class Protected Desert Landscape and Tourism destination that capitalizes on its sand sea, remote coastline, escarpment, wilderness and scenery, and its pro-conservation neighbours, to enhance both biodiversity conservation and sustainable socio-economic development for the region and country, within a larger co-managed tri-nation transboundary landscape of global renown working to become a World Heritage Site.

1.2 Goal

To wisely manage, protect and strategically develop the land and natural resources of the NNA within a "world class Protected Desert Landscape and Tourism destination" of globally significant biodiversity, scenery and wilderness under the brand "Desert Discovery", and to achieving a balance between protection and tourism that maintains a complete "sense of place", remoteness and wilderness while significantly increasing the NNA's contributions to Namibia's regional and national economic development objectives.

1.3 Objectives

- ❖ To conserve and wisely manage the landscapes, ecosystems and biological diversity of the NNA with particular attention to areas of high biodiversity, scenic and wilderness values, fragility and tourism pressure and, where necessary, to restore and rehabilitate degraded systems to their natural and productive states.
- ❖ To manage biodiversity and ecosystems as may be necessary and appropriate to maintain optimal biological diversity, ecosystem stability and resilience under highly variable and globally changing climatic conditions, to manage for open co-managed landscapes and to reintroduce and rebuild populations of plants and animals indigenous to the area within historic times, as appropriate under current and changing conditions.
- ❖ To promote and support appropriate land and natural resource uses that are compatible with the above objectives, including

appropriate levels of protection, tourism development and activities, consumptive and non-consumptive utilisation, research, environmental education, awareness and outreach initiatives, and to strive to instill in residents and visitors to the area its high environmental values and unique character which should be harnessed in sustainable ways to ensure its financial viability without compromising on sound conservation principles and practices.

- ❖ To significantly increase the contributions of the NNA to Namibia's social and economic development objectives at local, regional and national levels, through appropriate uses of the area that are in harmony with its ecological objectives.
- ❖ To build coalitions, establish partnerships and co-management approaches with citizens, neighbours, NGOs, businesses and other government institutions for focal and landscape level conservation, law enforcement, socio-economic development, marketing, awareness creation and education, monitoring and research and strategic planning and development, to enhance the diversity, viability and competitiveness of the NNA within the context of the Namib-Skeleton Coast National Park, Namibia and Southern African.
- ❖ To demonstrate the ecological, social and economic viability, sustainability and competitiveness of integrated and carefully zoned land uses and management, with an emphasis on conservation and tourism-based enterprises where relatively high human pressures occur in hyper-arid coastal areas.
- ❖ To seamlessly link the NNA with the other Areas of the Namib-Skeleton Coast National Park, and to emerging and future Coastal & Marine Protected Areas, under a management and marketing umbrella that expands to an ecosystems and landscape co-management approach with compatible neighbours and works towards creating a World Heritage Site between the Orange and Kunene Rivers (and beyond).

Part 2: Management units and zonation

2.1 Area background

The Namib-Naukluft Area of the Namib-Skeleton Coast National Park extends from the Hardap-Erongo regional boundary in the north (and bordering onto the Central Coastal Area) to the northern border of the Sperrgebiet in the south, formed by the main road to Luderitz but 20 km short of Luderitz extending due north for about 80 km and then due west to reach the coast at Gibraltar. To the west it borders on the Atlantic Ocean and to the east on freehold farmlands (Figure 2).

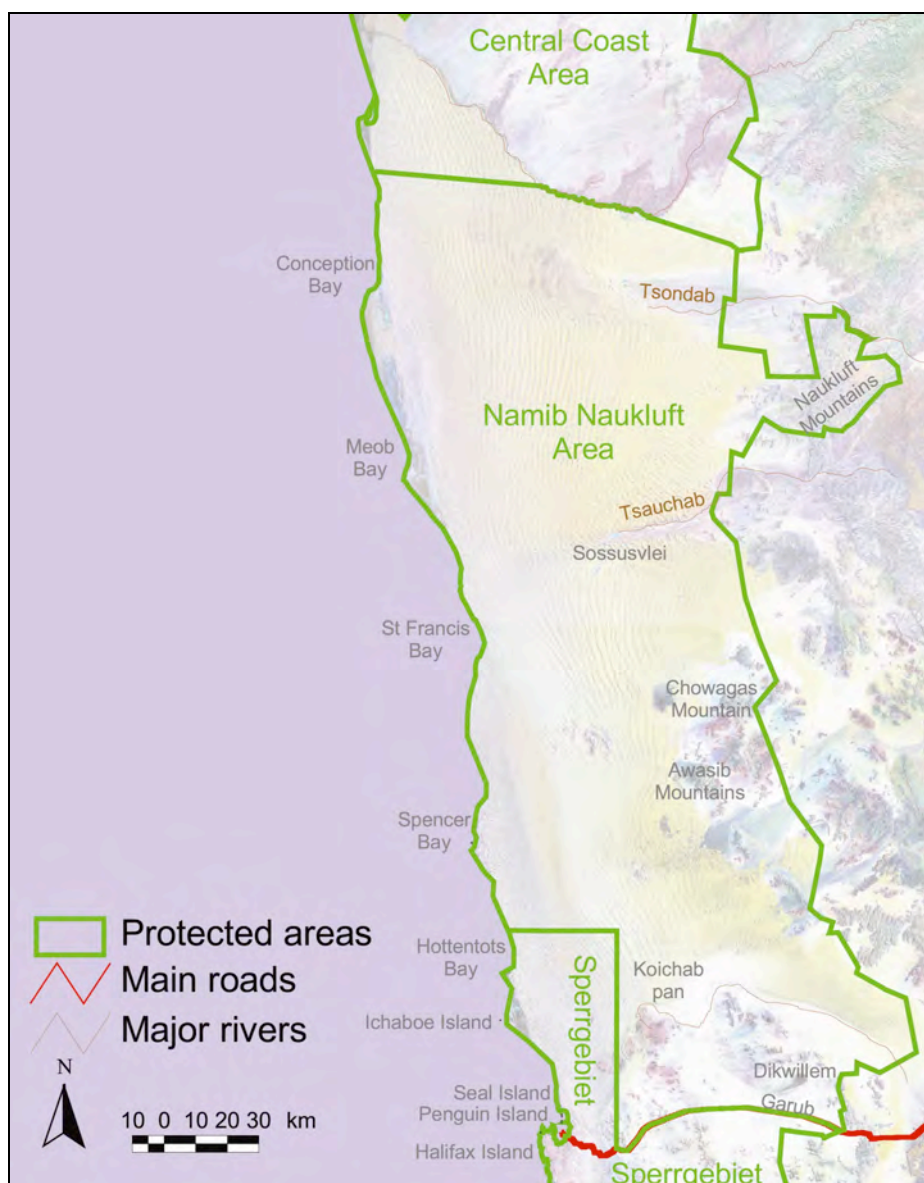


Figure 2: The Namib-Naukluft Area of the Namib-Skeleton Coast National Park

The NNA falls within the Southern Namib hyper-arid Desert and Coastal Biomes with the Naukluft extending to above the escarpment into the Desert-Dwarf Shrub Transition of the Nama Karoo Biome.

This Area incorporates:

- About 280 km of coastline, mainly sandy shores, with a number of bays often associated with rocky outcrops or bluffs, and coastal salt flats, with Damara Terns favouring the last mentioned as breeding sites.
- A continuous sand sea of dunes and sandy plains covering some 4 million ha, almost the entire area.
- Three ephemeral endorhetic river systems that end in pans amongst the dunes - Tsondabvlei in the north, Sossusvlei near the centre and Koichab Pan in the south.
- The Naukluft Mountains which rise from the desert plains at 400-500 m amsl to almost 2,000 m, forming near vertical escarpments and deeply incised valleys.
- The Area has a vast array of dramatic landscapes and scenery, and a huge sense of wilderness, novel to most visitors and highly accessible compared to most extreme desert ecosystems.
- The Area also contains a suite of uniquely adapted organisms to desert conditions, including endemic plants birds, reptiles and invertebrates.)
- The entire Area is designated an Important Bird Area (IBA), and it also qualifies as a Key Biodiversity Area (KBA).
- Two Important Plant Areas (IPAs) occur in the NNA, the Naukluft and the south eastern corner incorporating the Dikwillem range, which support a rich succulent plant community.
- The southern part of the NNA borders on a Cabinet-approved Marine Protected Area that includes the near inshore Mercury Island, a designated IBA.

The entire inter-tidal zone is co-managed by the MET and the Ministry of Fisheries & Marine Resources (MFMR). The MFMR are exploring the options of a second Marine Protected Area extending north along the NNA coast and into the CA.

2.2 Habitat units

Despite covering a relatively large area within the vast Namib-Skeleton Coast National Park (over 40%), the NNA has fewer habitats than the other Areas. For the purpose of this management plan, the

2.2.1 Actions	Timing	Record of progress
1. Review and fine tune habitat categories	By end 2009	
2. Prepare poster for staff, residents and visitors on the habitats (land forms and vegetation types) of the NNA, with photographs and sensitivity ratings	By mid 2010	

2.3 Zonation

2.3.1 Principle: The matrix of landscapes and habitats are optimally managed and sustainably used within the NNA, based on their sensitivity, conservation importance and business opportunity, in that order. This will be achieved by means of a Zonation Plan. This plan must also take into account the role that the NNA plays within the Namib-Skeleton Coast National Park, the greater Namib co-management Complex and the country. It must also remain dynamic and responsive to the potential for future opportunities, partnerships, linkages and corridors, and to developing the economic potential of the greater area within the context of biodiversity and landscape conservation, and sustainable development.

2.3.2 Vision: To zone the NNA for enhanced conservation management and appropriate utilization, to minimize potential conflicts between activities and to facilitate potential "bigger picture" conservation and development goals for the area.

2.3.3 Zones:

Zonation is based on best available information on environmental sensitivity, biodiversity status and conservation priorities. Around this are built the management and tourism activities and opportunities, and infrastructure development.

2.3.3.1 Environmental sensitivity

The areas of conservation priority and environmental sensitivity in the NNA are shown in Figure 3, based on their IUCN zonation categories (Table 5). The key areas are:

- The Tsondabvlei and river system
- The Kuiseb river and valley system
- The Sossusvlei and Tsauchab river
- The Koichab Pan and river
- The coastal salt pans and salt flats, which are also Damara Tern breeding sites. All Damara Tern sites (which may change over time) become automatically sites of conservation priority with appropriate management responses
- Coastal bluffs, headlands and bays
- All Inselbergs, with particular importance given to those with especially high biodiversity values such as Dikwillem in the south-east
- Mountain ranges on the eastern border of the NNA
- Gravel Plains
- The Naukluft, with its associated incised river courses and wetlands.

The following zones have been identified, based upon environmental sensitivity and appropriate land uses (Figure 4), and using IUCN categories for Protected Areas:

- Strict Nature Reserve (IUCN category 1a)
- Wilderness Area (IUCN category 1b)
- National Park (IUCN category 2)
- Monument (IUCN category 3)
- Habitat / species management areas (IUCN category 4)
- Protected landscapes / seascapes (IUCN category 5)
- Managed Resource Protected Areas (IUCN category 6).

Zones	Activities	Specific application in the NNA
<p>Strict Nature Reserve</p> <p>IUCN Category 1a</p>	<ul style="list-style-type: none"> • Highly sensitive and high value conservation / biodiversity areas set aside for sensitive and low non-intrusive scientific study • No or minimal mechanized access • No permanent 	<p>Areas of high environmental value and sensitivity:</p> <ul style="list-style-type: none"> • Tsondabvlei and river system, and adjacent dune and plain areas to the west • Coastal salt pans / flats • All Damara Tern breeding areas

	<p>structures</p> <ul style="list-style-type: none"> • No overnighting 	<ul style="list-style-type: none"> • Inselbergs such as Dikwillem and Uri-Hauchab
<p>Wilderness Area</p> <p>IUCN Category 1b</p>	<ul style="list-style-type: none"> • Sensitive ecosystems • High value "sense of place" • Low impact usage • No or minimal mechanization • No permanent structures 	<ul style="list-style-type: none"> • Bushman Hills, Chowagasberg, Awasibberge and Haiber Flats area • Part of the Naukluft mountain • Dikwillem area • The entire coastal strip
<p>National Park</p> <p>IUCN Category 2</p>	<ul style="list-style-type: none"> • Managed for conservation and controlled tourism • Mechanised access permitted • Overnighting only at designated sites 	<p>The whole NNA, but excluding the demarcated municipal areas, is proclaimed under this category. The other categories are managed as land-use zones within the overall National Park. Where no other zone is provided, the zone is taken to be "National Park"</p>
<p>Monument</p> <p>IUCN Category 3</p>	<ul style="list-style-type: none"> • Conservation of specific outstanding features, including landscapes, geology, paleontology, archaeology, history, cultural and heritage 	<ul style="list-style-type: none"> • Conception Bay to just south of Meob Bay
<p>Habitat / Species Management Areas</p> <p>IUCN Category 4</p>	<ul style="list-style-type: none"> • Protected areas managed mainly for conservation through active management intervention • To deliver benefits to people within the scope of sustainable practices 	<ul style="list-style-type: none"> • Part of the Naukluft? (hunting area check)
<p>Protected Landscapes / Seascapes</p> <p>IUCN</p>	<ul style="list-style-type: none"> • Relatively open access for public enjoyment • Generally higher intensity and lower regulatory areas 	<ul style="list-style-type: none"> • Kuiseb River, used by Topnaar community members and their livestock • Sossusvlei area, for high intensity tourism

category 5	<ul style="list-style-type: none"> • Add to welfare of local communities 	
Managed Resource Protected Areas IUCN Category 6	<ul style="list-style-type: none"> • Managed mainly for the sustainable use of natural resources, e.g. fishing. • Managed to ensure long-term protection and maintenance of biological diversity while providing at same time a sustained flow of natural products and services to meet local and national development needs, e.g. mining 	<ul style="list-style-type: none"> • Mining sites (following compulsory EIA) - but only mining of strategic minerals (no 'hobby', subsistence or dimension stone mining)

2.3.3.2 Land uses

The following land uses are permitted and or should be developed within the Namib-Naukluft Area (Table 6):

Land use categories	Specific applications
1. Accommodation	<p>1.1 Up-market Lodge development concession opportunity for the Gobabeb Research and Training Centre in the Kuiseb River on the border between the NNA and CA, max 24 beds, including an area in the CA and a small area into the dune area of the NNA. This concession package focuses on "information / research" tourism, and could involve overnight fly camps, hiring and 4x4 guided trails on approved routes.</p> <p>1.2 Up market Lodge concession site in the Sesriem / Sossusvlei area for Namibia Wildlife Resorts (NWR). Max 16 beds.</p> <p>1.3 Tented camp concession site, max 16 beds, on the coast, south of Meob Bay.</p> <p>1.4 Upgrade and develop existing old farm houses in the Naukluft area as (a) trophy hunting lodge and (b) B &B and/or self catering accommodation.</p>
2. Camp sites	2.1 Camp site at Hobas in the Kuiseb River, as a

	<p>concession site to the Topnaar community. This may be upgraded to add tourist bungalows or a lodge, either directly by the concessionaire or as a joint venture. Max 24 beds</p> <p>2.2 Sesriem camp site, run by NWR.</p>
3. Day visitors	3.1 Sossusvlei / Tsauchab River / Sesriem area, open to day visitors as well as Sesriem camping and lodge overnight "residents". Specific "Tourism carrying capacity and management systems" study and implementation plan to be commissioned for this high intensity use area
4. Ballooning	4.1 Ballooning concession area south of Sossusvlei / Tsondab River, with soft outer boundary because of dependence on wind
5. Hiking	<p>5.1 Guided hiking trail concession in the Kuiseb River, which may also be developed as a mule trail (to support hikers), with designated overnight camping sites with appropriate and approved waste management</p> <p>5.2 Unguided demarcated hiking trails in the Naukluft Mountains, with designated overnight camping sites</p>
6. Guided 4x4 trails	<p>6.1 4x4 guided coastal & dunes trail from Walvis Bay and/or Rooibank area to Conception Bay area concession, overnighting at designated sites with appropriate and approved waste management</p> <p>6.2 4x4 guided coastal & dunes trail from Luderitz and/or from the Aus-Luderitz road to Walvis Bay concession, overnight camping at designated sites with appropriate and approved waste management</p> <p>6.3 4x4 guided trans-Namib dunes trail from Naukluft to Conception Bay and north to Walvis Bay and/or Rooibank concession, overnight camping at designated sites with appropriate and approved waste management</p> <p>6.4 4x4 guided plains, river and dunes trail from the NNA eastern border about 40 km north of Sesriem to the Kuiseb River, down the river for</p>

	about 45 km, then south and west to Conception Bay and north to Walvis Bay and/or Rooibank concession, overnight camping at designated sites with appropriate and approved waste management
7. Wild horses trails	7.1 Guided wild horses concession area in the Aus / Garub south-eastern corner of the NNA, accessed by 4x4, horse riding or hiking, with overnight camping at designated sites with appropriate and approved waste management
8. Eastern Namib plains & mountains concession, with 4x4 link to coast	8.1 Concession area on eastern boundary, north of the Wild Horses Concession area, for small groups on concessionaire's vehicle(s) (max 2 vehicles), with overnight fly camping with appropriate and approved waste management, and with possible 4x4 link to coast and then down to Luderitz or Aus-Luderitz road
9. Hunting	9.1 Hunting concession in the Naukluft Area to the Topnaar community, quotas to be set by MET on a three-yearly basis, adjusted where necessary year-on-year, and PH contract to be reviewed and agreed by MET

2.3.4 Actions	Timing	Record of progress
1. Complete list of allowable activities per zone	By end 2009	
2. Prepare poster for residents, visitors and officials on zonation and activities	Mid 2010	

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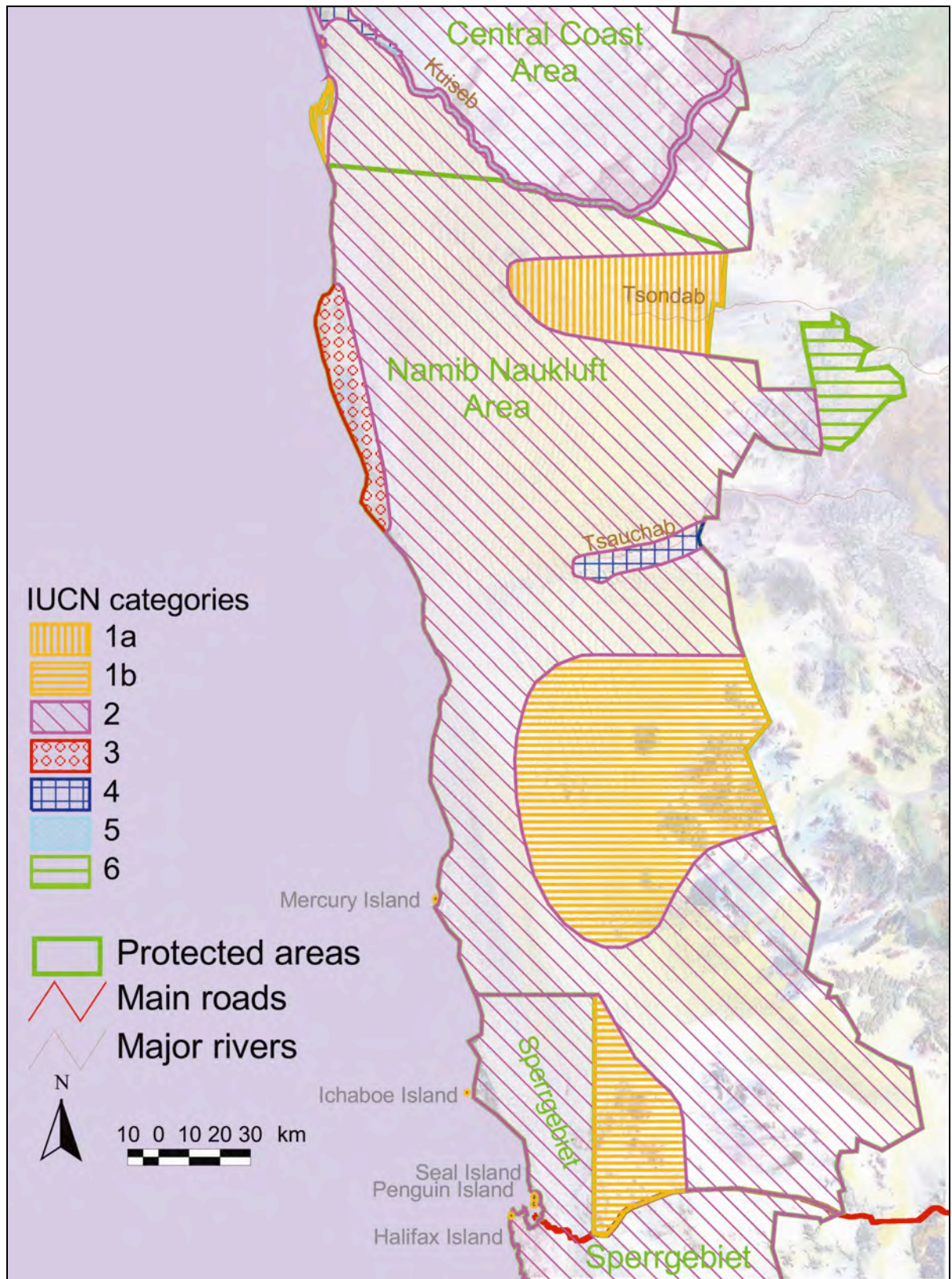


Figure 3: IUCN zones in the Namib-Naukluft Area of the NSCNP

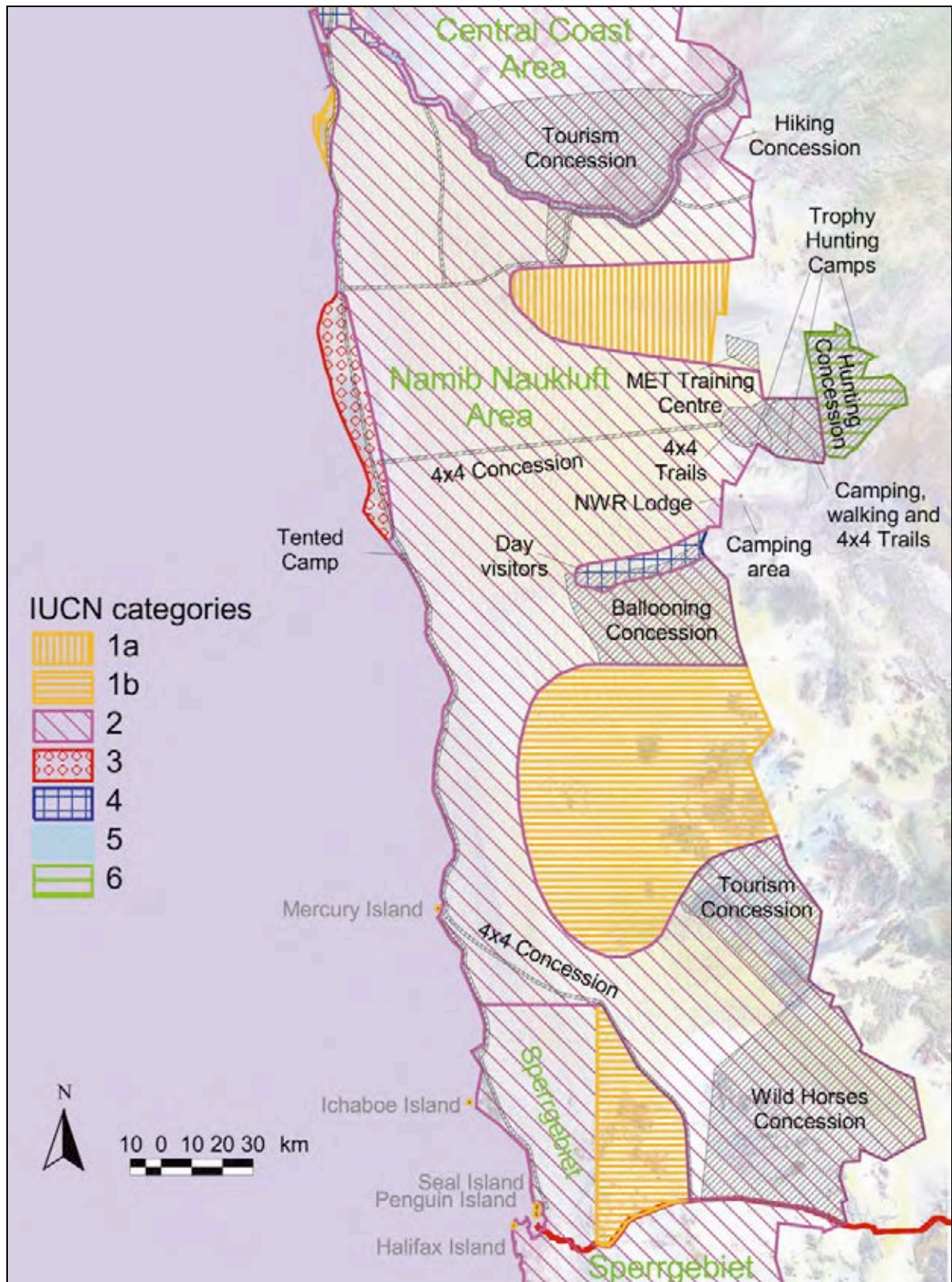


Figure 4: Land use and concessions for the Namib-Naukluft Area of the NSCNP

Part 3: Management targets

3.1 Landscape approach

3.1.1 Principle: Open, contiguous landscapes and seascapes are promoted and managed to ensure seamless linkages between the Namib-Naukluft Area and adjacent terrestrial and coastal ecosystems.

3.1.2 Vision: To maintain and, where relevant, expand the area under conservation management, and manage for larger landscape values, through partnership, with particular emphasis on:

- (i) west-east linkages between the marine, coastal and terrestrial ecosystems, in partnership with the MFMR and neighbouring land-holders; and
- (ii) north-south linkages with neighbouring Management Areas of the Namib-Skeleton Coast National Park.

3.1.3 Strategies:

- a) Work with MFMR to identify coastal and marine protected area collaboration adjacent to the NNA and to strengthen co-management mechanisms and partnerships.
- b) Establish seamless collaboration and cooperation procedures and practices with other management units in the NSCNP.
- c) A hard eastern boundary to the NNA is a major environmental impediment to natural wildlife migration up into the escarpment, particularly in dry times, and a significant cause of mortality and population diminution in some species. It also prevents species that would enter the NNA from the east in good rainfall years from doing so. It is therefore a high priority to pro-actively work with neighbours to promote open, co-managed systems that link the NNA to the escarpment.

3.1.4 Actions	Timing	Record of progress
1. Establish an effective collaborative framework between MET and MFMR to plan and harmonise terrestrial and coastal/marine protected areas and their rational and	2009 and ongoing	

3.2 Co-management

3.2.1 Principle: The "world class Protected Desert Landscape and Tourism destination" vision for the NNA, under the brand "Desert Discovery", is planned, managed, implemented, developed and monitored using a collective co-management approach that fully involves civil society, business and relevant government agencies.

3.2.2 Vision: To develop co-management mechanisms that fully integrate MET and MFMR, the relevant business sector, civil society (including environmental NGOs and communities), into all aspects of the management and development of the NNA in full collaboration and "smart partnerships", and with the respective partners being empowered to contribute to their full competitive competencies.

3.2.3 Strategies:

- a) To establish a strategic NNA Steering Body (the Strategic Forum - SF) that provides overall direction, assesses progress and performance and helps to remove constraints, and comprises representation at senior levels of relevant stakeholders including Regional Council, MET, MFMR, and a representative of each of the following: the tourism sector, neighbouring co-management partners and civil society in the form of environmental NGOs.
- b) To establish a practical and operational Consultative Forum (CF) that provides ongoing operational assistance, guidance, support and feedback, and comprises practitioners in relevant sectors such as business, NGOs, line ministries, community groups, neighbours and other supportive individuals and organisations.
- c) To establish a team of Honorary Wardens to work with MET and MFMR to help implement this MDP, legislation, regulations and zonation.
- d) Widely publicize the roles and authority of the Honorary Wardens.
- e) To establish procedures for planning, managing, developing and monitoring the NNA seamlessly with adjacent Management Areas of the Namib-Skeleton Coast National Park, with the coastal and marine ecosystem and with neighbours.

- f) Engage pro-actively with willing neighbours, to explore the establishment of a co-management and development approach for the "Greater Namib-Naukluft Complex" to enhance the development of a shared vision, common objectives and agreed principles, and promote a common management approach, as well as to facilitate park-to-neighbour liaison, with particular focus on establishing linkages between the Namib and the escarpment, to reinstate wildlife movement patterns and to help counter the potential impacts of climate change.
- g) To work closely with Regional Government, organized business and interest groups, communities, NGOs and the media to keep people informed of developments, to invite their input and participation in these and future evolving initiatives.

3.2.4 Actions	Timing	Record of progress
1. Establish a NNA Strategic Forum with clear Terms of Reference	By mid 2009	
2. Establish a practical NNA Consultative Forum with clear Terms of Reference	By mid 2009	
3. Appoint a team of Honorary Wardens with clear TOR and identification mechanisms, ensure that these appointments are well advertised and their responsibilities and authority well publicized and that the appointees receive orientation and training on their roles and responsibilities	By end 2009	
4. Establish close and collaborative working relations and clear procedures for seamless collaboration between the different Management Areas of the Namib-Skeleton Coast National Park	Mid 2009	
5. Establish close and collaborative working relations	Mid 2009	

and clear procedures for seamless collaboration between MET and partners on the terrestrial landscapes with MFMR in the coastal and marine ecosystems		
6. Engage pro-actively in the development of a Greater Namib-Naukluft Co-management Complex with park neighbours	Mid 2010	
7. Create an inclusive, participatory environment within the NNA where all interested stakeholders can contribute ideas, energy and time; foster a spirit of volunteerism to optimize potential support for the management and development of the NNA	Ongoing	
8. Initiate a feasibility assessment for the greater Namib-Skeleton Coast Complex (Park and neighbours) to become registered as a World Heritage Site.	Mid 2010	

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3.3 Biodiversity conservation

3.1.1 Principle: The comprehensive diversity of landscapes, habitats, plants and animals indigenous to the NNA are protected and both ecosystem functioning and natural evolutionary processes take place effectively.

3.1.2 Vision: To protect and conserve the diversity of "sense of place", landscapes, habitats and biota of the NNA in healthy and productive condition within the context of the Namib-Skeleton Coast National Park and the Greater Namib Area.

3.1.3 Strategies:

- a) Because of the large open systems involved, and the intention to create linkages with adjacent ecosystems (e.g. coastal and marine to west and escarpment belt to east), ecosystem management should be minimal, and a largely hands-off approach should be adopted, but 'hands-on' in terms of forging strategic partnerships for open landscape co-management and to prevent and/or minimizing damage to important habitats and species in the NNA.
- b) Should it become necessary to apply active management, interventions should aim to manage the arid ecosystems for long-term diversity, health, productivity and climate change resilience and adaptation, by ensuring connectivity, preventing over use of all components, including water, fauna and flora, landscapes, etc.
- c) Allow and promote variability in management and "patchiness" in ecosystem expression in response to variable climatic conditions and ecosystem functioning.
- d) Build up a good monitoring record of ecological and bio-climatic information, including the diversity and abundance of various species in different taxa, including the less studied lower plants, invertebrates, etc.
- e) Monitor the health of populations of species high on the food chain (e.g. key predators and scavengers), flagship and key-stone species and other strategic key indicator species (including indicator species for early warning of climate change impacts) - if these species prosper it follows that the base of the food chain is likely to be diverse and in good condition.

- f) Monitor key habitats such as Important Bird Areas and Important Plant Areas.
- g) Monitor human impacts of landscapes, ecosystems, habitats and species with particular attention to fragile and high value components of the system, and human activities known to have significant impacts.
- h) Participatory and outsourced approaches for monitoring should be used, fully involving relevant stakeholders.
- i) No poisons or pesticides (or other toxic chemicals) may be used in the park.

3.3.4 Actions	Timing	Record of progress
1. Set up (where necessary), implement and support monitoring systems for ecosystem health, key habitats, and biodiversity building on existing systems used elsewhere (e.g. Event Book system) and continuing with long-term data series (e.g. wetland bird counts)	During 2009	
2. Identify priority baseline information needs	During 2009	
3. Set up, implement and support monitoring systems for human impacts on important components of the CA	During 2009	
4. Ensure that no toxic substances, poisons or pesticides are used in the CA	Now and onwards	

The following components are subsets of the Biodiversity Conservation category, and provide more details on specific components.

3.3.a Wildlife population management

3.3.a.1 Principle: A rich diversity of indigenous wildlife prospers within an open, dynamic and resilient ecosystem.

3.3.a.2 Vision: Wildlife population numbers will be managed, mainly through self-regulation, at levels where biomass carrying capacity is considered conservatively appropriate and sustainable, per species and for the total wildlife population, under different rainfall and range conditions. Mass mortalities during droughts will be avoided - mainly by working to establish open systems, particularly west-east. Population fluctuations due to good breeding and slow attrition during wet and dry cycles, and from predation, will not be cause for concern.

Trophy hunting, under carefully controlled conditions, based on population census data and very conservative quotas will be permitted only in a selected area of the Naukluft mountains and for approved ungulate species that are not considered to be threatened. Live capture for conservation purposes such as population reduction and special reintroduction elsewhere will be permitted.

3.3.a.3 Strategies:

a) Population trends, health (age and sex structures and body condition) and distribution of populations will be monitored as necessary, as part of the Namib-Skeleton Coast National Park monitoring process.

b) Wildlife management decisions will be taken in an adaptive manner, with a minimalist intervention philosophy, and based on good monitoring and research information, as may be decided from time to time.

3.3.a.4 Actions	Timing	Record of progress
1. Design and implement integrated monitoring systems for rainfall, vegetation condition (particularly in vicinity of artificial water points) and	Design during 2010, implementation thereafter and ongoing	

wildlife (numbers, age & sex classes and condition), making use of "Event Book" system		
2. Obtain and document historic information on wildlife diversity, numbers, extinctions and other relevant issue.	2010	
3. Proactively review information on key variables to determine if any management actions are necessary, and identify management options	Systems set up and tested starting 2011 and then ongoing	
4. Adaptively manage wildlife using a minimalist intervention approach and most relevant practices	As necessary	

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3.3.b Wildlife introductions

3.3.b.1 Principle: The historic diversity of wildlife and their full suite of interactions are reinstated, as far as is practically possible under prevailing conditions,

3.3.b.2 Vision: Re-introduce and/or augment as appropriate species that were locally indigenous within historic times provided these have a reasonable chance of survival under current conditions and are practically and socially acceptable.

3.3.b.3 Strategies:

- a) Carry out an assessment of species that historically occurred in the NNA of the Namib-Skeleton Coast National Park.
- b) Review which species that no longer occur, or occur at below optimal numbers, could be re-introduced under current conditions, and prepare a prioritized list.
- c) Be mindful that the NNA is on the extreme western edge of a number of species' ranges. In higher rainfall years such species may/would have moved westwards into the NNA of the Park, and in lower rainfall years they would have retreated eastwards into the escarpment. Once large, open areas have been secured, reintroductions into the greater area may be viable, but which would not be so if confined to the NNA. Thus take a larger picture view of wildlife reintroductions, and be mindful of the linear oases provided by the Kuiseb River and other ephemeral systems entering the NNA.
- d) Introduce wildlife in phases as per the list, and subject to rainfall and veld condition being adequate to enhance survival chances.
- e) Acquire wildlife from similar habitats (e.g. Namib and Karoo Transition ecosystem) for genetic integrity and optimal chances of success.
- f) Introduce wildlife in sufficient numbers to be viable, rather than having small token introductions.
- g) Where species are likely to recolonise or to augment existing populations by in-migration, allow this to happen rather than active reintroduction.
- h) No species exotic to the NNA of the Namib-Skeleton Coast Park will be introduced.

- i) No subspecies or components of populations from elsewhere will be introduced if there is any risk of genetic pollution to the indigenous populations' genetic integrity, and where suitable animals can be acquired from within the required gene pool.
- j) In the case of introductions that have a potential impact on communities within and adjacent to the NNA, full consultations will take place prior to any introductions.

3.3.b.4 Actions	Timing	Record of progress
1. Carry out an assessment of historic distributions of wildlife in and adjacent to the NNA	2010	
2. Based on the above and present-day viability and acceptability, develop and implement a phased reintroduction and augmentation plan (e.g. giraffe in the Kuiseb River, Red Hartebeest in the Naukluft, etc).	2011 and ongoing	
3. Monitor introduced and augmented populations - numbers, breeding, sex and age ratios, distribution, etc.	From each introduction and ongoing	

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3.3.c Alien plants and animals

3.3.c.1 Principle: The NNA is free of all invasive alien plants and animals, with the exception of the Desert Wild Horses in the Garub area.

3.3.c.2 Vision: No feral populations of alien plants and animals will be permitted within the NNA, with the exception of the Wild Horses which will be confined to the Garub area and treated as part of the history of the region. Domestic species will not be permitted in the NNA except under concession (e.g. horse trails), and then only where they pose no threat of invasion, are under the full control of designated owners or are an integral part of the operation of the park, and where they pose no threat to the conservation of indigenous species and the integrity of the park.

3.3.c.3 Strategies:

- a) Establish a monitoring system for alien species, with particular attention to high risk species and areas such as along rivers and drainage lines, roadways, mining areas, water points, etc.
- b) Manage feral populations of plants and animals as appropriate and practical including eradication where feasible.
- c) Establish community interest groups of local residents to help eradicate and monitor alien species, particularly where infestations occur from outside the NNA, e.g. along drainage lines entering the park.

3.3.c.4 Actions	Timing	Record of progress
1. Manage and where practical eradicate invasive alien species throughout the NNA	2010 and ongoing	
2. Work with neighbours to eradicate alien plants from drainage lines entering the NNA	2010 and ongoing	
3. Follow up on cleared areas and remove re-growth/new seedlings	2010 and ongoing	
4. Establish community interest groups of local residents to help address the invasive alien problem	2010 and ongoing	

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3.4 Coastal management

3.4.1 Principle: The intertidal coastal zone, its biota and the species that transcend the marine/terrestrial interface are managed jointly by the MET and MFMR under agreed co-management principles and protocols that promote synergy, efficiency and elevated conservation management, monitoring and protection of habitats, processes and species.

3.4.2 Vision: The intertidal co-management approach is a model of collaboration with clear benefits to the ecosystem and responsible institutions, and this approach is expanded to the entire Namibian coast.

3.4.3 Strategies:

- a) A close and mutually supportive working environment will be created between the Park MET and MFMR institutions and their respective staff. To this end, a Park MET-MFMR Management Committee will be established.
- b) The above Committee will identify the key areas, issues and species that require joint monitoring and management.
- c) The above committee will establish operational principles, procedures and protocols for monitoring, managing and reporting on the areas and biota of mutual interest, as well as means of collaboration, communication and mutual support.

3.4.4 Actions	Timing	Record of progress
1. Establish a MET/MFMR Management Committee	2009	
2. Establish practical and efficient operating procedures for collaboration, communication and reporting for identified priority areas and species.	2009	
3. Explore ways of expanding collaboration and co-management where this would be beneficial to the ecosystem and to the partner institutions.	2010 and ongoing	

3.5 Tourism management and development

3.5.1 Principle: Use of the NNA is planned and implemented to retain a "Desert Discovery" atmosphere, safeguarding its wilderness and "sense of place" attributes, within a zonation and management framework that ensures that the character, beauty, diversity and integrity of the NNA is maintained, and that visitors have an exceptional experience.

3.5.2 Vision: To provide for present and expanding high quality eco-friendly tourism opportunities through good planning, zonation, management and collaboration between the conservation and tourism sectors, to help raise awareness and educate visitors about the NNA and the Namib-Skeleton Coast National Park, desert and coastal environments, and to promote investment opportunities for all Namibians, particularly those previously excluded from the tourism sector as envisaged in the MET's Concessions policy and the Tourism Transformation Charter.

3.5.3 Strategies:

- a) Develop a detailed "Tourism Plan" for the NNA within the context of the Namib-Skeleton Coast National Park that includes a feasibility assessment, sets carrying capacities, management actions and tourism impact monitoring within the context of the Area's zonation plan. The plan should address the following components:
- Take full cognizance of the environmental sensitivities and biodiversity values of the area and its zonation, and should strive to enhance, but never diminish these.
 - Take full cognizance of the "Desert Discovery", wilderness and "sense of place" attributes which the NNA has adopted.
 - Take full cognizance of the rights and livelihoods of local communities and neighbouring residents in the area.
 - Promote a diversity of multiple market tourism, but with an emphasis on promoting low impact "Desert Discovery" tourism packages.
 - Provide affordable tourism access to the NNA, particularly for Namibians.
 - Make special provision for opportunities for community participation in the tourism development of the NNA. In this regard, the MET's Concessions policy will apply.

- Place special consideration on promoting broad-based Black Economic Empowerment and involvement in the tourism development of the NNA. FENATA's Transformation Charter should be applied.
 - Make provision (as incentives) for neighbours practicing compatible land uses to obtain concession into the park, thereby cementing commitments to co-management and open landscape approaches.
 - Establish Concession Areas for Educational 4x4 Desert and Coastal Trips, wilderness and walking trails, accommodation facilities, etc.
 - Focus should be on high financial return, low impact tourism in the more remote areas.
 - Explore potential of small high end-of-market lodges on eastern edge of area.
 - Develop open air museum and Information Centre in Sesriem / Sossusvlei area.
 - Develop appropriate tourist maps of the CA and relevant information materials.
- b) Prepare and disseminate maps and information on the ecology, biodiversity, sensitivity, zonation and regulations of the NNA.
- c) Develop agreed procedures and conditions for the various concessions.
- d) Aerial zonation, heights and no-flying zones to be determined and form part of the zonation and tourism plan.
- e) Ensure that tour guides are well trained, motivated and well tuned to visitor's needs and local conditions.
- f) Ensure that the role and authority of Honorary Wardens are well publicized.

3.5.4 Actions	Timing	Record of progress
1. Develop a detailed Tourism Plan	2009	
2. Develop agreed procedures and conditions for the various concessions	Late 2009 and ongoing	
3. Design phased implementation mechanisms for the Tourism	2010 and implement in	

3.6 Prospecting and mining

3.6.1 Principle: No prospecting and mining activities will take place for non strategic minerals anywhere in the NNA. For strategic minerals, no mining will be permitted in areas zones as IUCN Categories 1a (Strict Nature Reserves), 1b (Wilderness Areas) and 3 (Monuments). All prospecting and mining activities in other areas are planned, managed and decommissioned using best available practice, taking into account long-term national benefits vis-à-vis benefits from other current and potential land-uses, and applying precautionary and polluter pays principles and due caution so as to minimize negative environmental impacts.

3.6.2 Vision: To not allow any prospecting and mining activities anywhere in the NNA for non-strategic and low value minerals (e.g. dimension stone), and no prospecting and mining in areas zones as 1a, 1b and 3 under IUCN categories. Further, to integrate high value nationally strategic prospecting and mining activities in other parts into the land-use and management of the NNA in ways that minimize environmental and socio-economic impacts and that optimize biodiversity, ecosystem and landscape conservation. To restore areas damaged by past prospecting and mining to as near a natural state as can reasonably be expected, or as may be decided.

3.6.3 Strategies

- a) Key zones categorized for high conservation values (i.e. those falling into IUCN categories of 1a, 1b and 3) will be demarked and closed to prospecting and mining.
- b) Prospecting and mining in other parts of the NNA will be for high value nationally important minerals only. No low value, non-strategic prospecting and mining will be permitted (e.g. dimension stone, semi-precious stone).
- c) The long-term national benefits from the use of the land for mining must clearly outweigh benefits from other appropriate forms of land use, such as recreation and sustainable tourism. The onus is on the proponent to demonstrate such national comparative benefits, taking into account ecosystem services and non-monetary benefits of peoples' perceptions and how residents and visitors wish to use their countryside.
- d) Applying safeguards is a key strategy for avoiding and/or reducing impacts to acceptable levels. All prospecting and mining activities **MUST** be preceded by an Environmental Impact Assessment in

accordance with the word and spirit of Namibia's EA Policy (1995) and legislation (Environmental Management Act No. 7 of 2007, and Minerals (Prospecting and Mining) Act, 2003.). The logical consequence of the EIA is the compilation of an Environmental Management Plan (EMP). The EMP must define both outcomes and the methodology (in some detail) as to how the outcomes will be achieved.

- e) Approved prospecting and/or mining company must provide the NNA staff with an environmental report every 6 months, showing its progress towards meeting agreed upon safeguard targets. Once prospecting and/or mining has ceased, the impacts must be rehabilitated in accordance with the stipulations of the EMP.
- f) Communication with prospecting and mining companies is conducted on a regular basis to ensure that mutual-expectations are clear and re-enforced. Mining representatives will serve on the Consultative Forums, but it is still necessary for the Park staff to visit and talk to operators on the ground. Regular visits will not only facilitate dialogue, but they will also demonstrate MET's "hands on" approach towards monitoring. Visits by MET staff must be fully facilitated by mining companies in a spirit of open-cards and transparent partnership.
- g) Monitor implementation of EMPs, paying special attention to the achievement of safeguard targets. A detailed inspection report must be completed after each visit to the prospect or mine by Park staff, with copies sent to MET Head Office, the Strategic Forum, the mine/company inspected and the Mining Commissioner within MME. The report must include an "action" column, where it is clear what action needs to be undertaken by whom and by when, to remedy an environmental concern. As far as possible, the inspecting office should take photographs of key issues of concern. These should be digital since the camera will record date and time - both essential pieces of information. If possible, the inspecting officer must obtain the counter-signature of the prospector/miner who was present during the inspection.
- h) In the case of non-compliance, Park staff must immediately report the matter to the Strategic Forum in order to enable "in house" remediation. If this fails, the matter must be reported to MET HQ for higher level attention. The Park should request external review/inspection should they not have the technical capacity to assess the situation themselves. If possible (i.e. within the provisions of the law), the prospector/miner must be responsible for carrying all the costs of external consultants. Refer to the Environmental Management Act (No. 7 of 2007) for specific actions to be taken.

- i) Establish a "daily park user fee" mechanism (as per filming industry) for prospecting and mining. The fees shall accrue in an account available for park management and development activities in compliance with the MDP. The administration and management of the account shall be by the CF and follow recognized accounting practices and standards.

3.6.4 Actions	Timing	Record of progress
1. Compile an inventory of all prospecting and mineral licenses in the NNA, noting type of license, its boundaries, conditions of approval, ownership, status and contact persons.	2009	
2. Establish a library of all the relevant EIA reports, EMPs and Records of Decision for each license.	2009 and ongoing	
3. Develop a "prospecting and mining monitoring sheet" that enables easy field monitoring.	Mid 2009	
4. Compile a "prospecting and mining inspection schedule" - say, twice annual visits. The schedule should be provided to each mineral license holder so that they know when to expect an inspection (this does not preclude unscheduled spot-checks).	2009	
5. Obtain agreement from MME to allow the establishment of park specific prospecting and mining user fees.	2009	
6. Monitor as per schedule.	Commence 2009 - thereafter ongoing	

3.7 Law enforcement

3.7.1 Principle: Illegal entry, activities and use of wildlife, plants and other natural resources within and adjacent to the park is controlled and kept to a minimum.

3.7.2 Vision: A zero tolerance approach will be followed against all illegal activities within and adjacent to the NNA. A partnership of collaboration will be established with all relevant stakeholders, under MET/MFMR leadership, and fully incorporating the Honourary Wardens, to secure adherence to law and order in and around the CA.

3.7.3 Strategies:

- a) Develop a practical, harmonized approach to the implementation of law enforcement within the context of this MDP, Park legislation and regulations, by establishing strong partnerships between MET and MFMR, with the Namibian Police and Traffic Department and by establishing a team of Honourary Wardens.
- b) Plan, develop and implement, in partnership with MFMR, Namibian Police and Traffic Department, and the Honourary Wardens, an efficient and effective tourism management and access control system.
- c) Ensure security and anti-poaching (including plant, reptile and other natural resource collection/theft) patrols and surveillance are conducted, in partnership with supportive neighbours, at regular but unpredictable intervals, particularly in high-risk areas (e.g. along main access routes and around mining areas) and that they are highly visible.
- d) Develop an attractive reward system and let it (and the zero tolerance approach) be widely known in the area.
- e) Establish a "Hot-Line" for people to report transgressors, and an efficient response mechanism.
- f) Ensure that the Honourary Warden system, their roles and authority, are well publicized and known throughout the area, to both residents and visitors.
- g) Ensure that MET, MFMR and Honourary Wardens are well trained to preserve and collect evidence so that arrests result in convictions.

3.7.4 Actions	Timing	Record of progress
1. Plan (with relevant partners,	2010	

including Hon. Wardens and supportive neighbours) a practical plan for implementing law enforcement in the context of this MDP & relevant legislation		
2. Develop (with partners) an effective tourism management and access control system, with particular attention to the holiday seasons	2009	
3. Disseminate information on zero tolerance approach & reward scheme, as well as information on roles and authority of Hon. Wardens	2009 and ongoing	
4. Carry out regular patrols (ground and air) to ensure high presence level	Ongoing	
5. Train staff and Hon Wardens in collection of evidence	2010 and ongoing	
6. Establish a Hot-Line for reporting of transgressors	2009	

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3.8 Water management

3.8.1 Principle: A minimalist and ecologically appropriate water plan is implemented, taking into account neighbouring land use and water provision.

3.8.2 Vision: The provision of water for wildlife will be undertaken strategically in the interests of maintaining biological diversity in a fenced ecosystem. Emphasis will be placed on securing open systems and corridors in west-east and north-south directions, to facilitate natural ecological processes and reinstating historic movement patterns. Water use for other purposes will be judicious, minimalist and based on environmental assessment principles.

3.8.3 Strategies:

a) Water point development and management will be on a strategic basis - the default setting is a minimalist provision of water.

b) In a critical situation, e.g. wildlife building up along fenced eastern boundary in times of extreme drought, then temporary water provision may be availed if considered absolutely necessary.

c) The park-neighbour policy and strategy will be energetically pursued to explore partnerships to the east, removal of fences and the opening up of west-east corridors with landowners that share compatible values and land-uses with those of the park.

d) All natural water points will be carefully managed to avoid disturbance and degradation, and an appropriate monitoring system will be established.

e) Abstraction of groundwater from the NNA, and in adjacent areas, will be carefully monitored, both the volumes abstracted and impacts on the environment, and adaptively managed.

f) Use of water for tourism, mining and other purposes must be judicious, minimalist, demand managed and monitored. Sustainable sources of water must be used. No unsustainable extraction will take place or any extraction that may have negative biodiversity impacts.

3.8.4 Actions	Timing	Record of progress
1. Create a map and inventory of all natural water points as well as boreholes & infrastructure, together with their attributes, such as yield, depth and water quality	2009	
2. Ensure that all natural water points remain undisturbed, with low level monitoring	Ongoing	
3. All bulk water abstraction projects must be preceded by an EIA. The default setting is no bulk water abstraction should be allowed in the NNA	Ongoing	
4. Good water demand management practices and monitoring should be implemented for water use in the NNA and throughout the Namib-Skeleton Coast NP	Ongoing	

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3.9 Fencing

3.9.1 Principle: Open systems are maintained for the largest possible landscape integrity, both within and beyond the NNA and the Namib-Skeleton Coast National Park.

3.9.2 Vision: Remove all internal fences excepting those fences that have strategic value (e.g. to contain recently introduced high value wildlife).

Remove/breach boundary fences where neighboring land-use is compatible and where joint venture / co-management agreements have been secured.

Secure boundary fences where neighboring land use and/or security is a threat to the park's integrity, or where secure fencing is essential for good neighbourliness (e.g. to protect neighbouring small stock farmers from predators).

3.9.3 Strategies:

- a) Boundary fences (east border of the NNA) where security is of concern and where neighbours practice incompatible land uses will be monitored and maintained.
- b) Boundary fences (east border of the NNA) where neighbours practice compatible land uses, are in support of establishing open systems and where co-management agreements are in place, will be removed or breached and co-management practice implemented (e.g. joint monitoring, surveillance, law enforcement).

3.9.4 Actions	Timing	Record of progress
1. Patrol & maintain fences as appropriate where security is of concern and with incompatible neighbours	2009 and ongoing	
2. Negotiate with sympathetic neighbours for boundary fence removal/breeching	2009 and ongoing	

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3.10 Roads

3.10.1 Principle: A minimal, practical, ecologically and aesthetically appropriate road network will be maintained to help achieve the objectives of the NNA.

3.10.2 Vision: Rationalise and maintain a road network to serve the management (including monitoring and research) and tourism needs of the NNA.

Close and rehabilitate obsolete roads. No new roads developed without strong rationale and EIA, and no off-road driving except in areas clearly designated and zoned for this purpose, e.g. up coastal and across dune concessions.

3.10 Strategies:

- a) A carefully selected network of roads will be maintained for the effective management of the park and approved tourism activities.
- b) Existing roads, tracks and borrow pits not forming part of the network will be closed and rehabilitated.
- c) Any new roads and associated infrastructures (e.g. borrow pits) will be subject to an EIA.
- d) No billboards (that advertise products or services) will be allowed anywhere in the NNA.

3.10.4 Actions	Timing	Record of progress
1. Develop an accurate GIS-based map of current roads & tracks, including making use of aerial photographs	2009 and ongoing	
2. Develop a road network plan showing roads and related infrastructure to be retained or decommissioned and rehabilitated	2010	
3. Close off unneeded roads	From 2010	
4. Rehabilitate closed roads, tracks and old borrow pits	2010-2013	
5. Any new roads, borrow pits, etc to be subject to EIA	Ongoing	

3.11 Monitoring and Information Management

3.11.1 Principle: Carefully selected indicators and groups of indicators are monitored to allow for timely and judicious assessments and adaptive management.

3.11.2 Vision: A minimal but regular monitoring of key climate, habitat and biodiversity, land use impacts, water quality, park management performance and other key indicators will be conducted and promoted to help understand ecological changes, stresses and management effectiveness.

Participatory monitoring will be encouraged and, where appropriate, monitoring shall be outsourced to special interest groups and specialist stakeholders.

Information and data resulting from monitoring activities will be recorded, stored and curated as time-series and geo-referenced data sets within a Namib-Skeleton Coast National Park Information System.

The information produced from the monitoring systems will be in the public domain and will feed into adaptive management decision-making.

3.11.3 Strategies:

- a) Monitoring will focus on key indicator processes, impacts, habitats and species, with an emphasis on ensuring regular data collection at appropriate intervals, cost efficiency and sustainability.
- b) Monitoring will also assess the effectiveness of management of the NNA, applying best practice tools such as "Namibia's Management Effectiveness Tracking Tool" (NAMETT).
- c) Monitoring systems shall apply approved tools already being widely used (e.g. Event Book system), and shall also continue with systems already established and running within the NNA.
- d) Monitoring systems will be balanced to ensure that the entire range of critical information needs is covered.
- e) A Namib-Skeleton Coast Park Information System will be established to store, manage and help analyse spatial and temporal data sets as well as other pertinent information.
- f) Information will be made widely and freely available, in accessible format, to all stakeholders, including via the media.

- g) The Gobabeb Training and Research Centre will be the host institution for collating, curating, analyzing and disseminating data and information resulting from monitoring within the NNA and the entire NSCNP.

3.11.4 Actions	Timing	Record of progress
1. Develop an appropriate monitoring framework to include the monitoring requirements of the NNA, and incorporate ongoing monitoring initiatives and where appropriate, adapt other national systems such as the "Event-Book", with appropriate training for staff and other implementing partners	2009 onwards	
2. Develop an accessible and user-friendly Namib-Skeleton Coast National Park Information System and meta database (for spatial & temporal data and other info), that can be easily expanded and up-scaled to serve larger co-managed landscape complexes, to: <ul style="list-style-type: none"> • store, manage, curate data/info • retrieve, interrogate, analyse and aggregate data/info • generate reports based on carefully designed templates for key information needs 	2010 and ongoing	
3. Establish fixed photo-point and aerial photography monitoring of key aspects (e.g. ephemeral river for impact of water abstraction, tracks, mining footprint, etc), and repeat photographs at regular intervals (every 6 or 12 months)	2009 onwards	
4. Make time-series data and	Ongoing	

analysed information available for adaptive management, and for distribution to interested stakeholders, decision-makers and the general public		
5. Establish the Gobabeb Training and Research Centre as the base for all monitoring data and information for the NNA and the NSCNP		
6. Use above data and information to prepare an annual State of Namib-Skeleton Coast National Park Report. Establish computer-based analyses and map/figure protocols to automate this process as far as possible, with minimal explanatory text.	2010 and ongoing	

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3.12 Research

3.12.1 Principle: Management and development of the NNA of the Namib-Skeleton Coast National Park will be information-based, drawing on good quality research and monitoring. To ensure that good data are available, the Park will implement a research-friendly and supportive philosophy and encourage the non-invasive use of the park as an open air laboratory. The Gobabeb Training and Research Centre shall be the research headquarters for the terrestrial components of the Park, while the Fisheries Research and Information Centre (FRIC) shall serve this function for the coastal and marine ecosystems.

3.12.2 Vision: Park management will be based on good scientific information. Gobabeb will be supported to become the research headquarters for the Park, and to become a research hub for MET and partner research on desert systems of Namibia. A supportive environment will be created for visiting scientists, including the facilitation of research permits. Two levels of research are recognized:

- (a) Applied research in support of priority park information and management needs, and
- (b) Basic or interest research identified by outside researchers.

Preferential support will be given to the former, while the latter will be supported when feasible. All forms of research are encouraged, including biological, hydrological, geological, paleontological, archaeological, historical, climatological, social, economic, etc.

3.12.3 Strategies:

- a) A prioritised and open-ended list of key research topics will be developed for the Park and disseminated to appropriate research institutions.
- b) An appropriate support mechanism will be developed for visiting scientists, making use of Gobabeb where appropriate, with emphasis on those addressing priority research topics relevant to the park.
- c) Appropriate mechanisms will be developed to ensure that optimum feed-back and other values from national and visiting researchers are obtained.
- d) Links will be established with research activities carried out in other parks, particularly in arid regions, as well as with other relevant research organisations and field stations in Namibia, and comparative studies between the different desert ecosystems will

be encouraged, including transboundary with other components of the Nama and Succulent Karoo, Kalahari and Namib Ecosystems, in adjacent countries.

- e) Ensure that Gobabeb and FRIC are integrated into the Park Information System and meta database and that results from research are added to this System.

3.12.4 Actions	Timing	Record of progress
1. Develop an open-ended list of priority research topics based on information needs for the NNA management, facilitated by Gobabeb and the FRIC	Start in 2009 and ongoing	
2. Design a reciprocal "support package" for researchers addressing priority research topics and ensuring maximum returns to the NNA, the Park and Namibia, facilitated by Gobabeb	2009 and ongoing	
3. Participate actively in comparative research programmes across the arid zones and between the various desert ecosystems	2010 and ongoing	
4. Ensure research outputs and findings are integrated with monitoring data in the Park Information System.	From 2008	

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3.13 Education and Awareness

3.13.1 Principle: The Namib, Escarpment and adjacent coastal ecosystems offer unique open-air classroom and laboratory opportunities for education and awareness creation on the subjects of geology, geomorphology, climatology, hydrology, zoology, botany, arid-zone ecology, wetland biology, adaptive evolution, paleontology, archaeology, conservation, sustainable development and many other fields. The NNA contains dune fields, gravel plains, ephemeral rivers, sandy and rocky shores, inselbergs and mountain ranges, a host of arid-adapted plant and animal life plus human-ecosystem interactions. The area thus has huge educational and awareness-raising potential, which will be exploited in the interests of ensuring that visitors and staff are well informed and enriched by associating with the NNA and the Park.

3.13.2 Vision: To develop good quality, accessible and stimulating information and activities on the key biophysical and socio-archaeological aspects of the different habitats within the Namib, Escarpment and coastal ecosystems that are represented within the NNA, and to share this information with guests, visitors, youth groups, specialist groups, decision-makers, officials and the general public in interesting and exciting ways so as to promote an understanding of and commitment to the conservation and sustainable development of the Namib Desert and coastal areas of Namibia. Participatory and collaborative mechanisms will be used, harnessing the strengths of different government agencies, NGOs and special interest groups, the business community and the Gobabeb Training and Research Centre.

3.13.3 Strategy

- a) Establish an open air Museum and Information Centre in the NNA, preferably in the immediate vicinity of the Sesriem / Sossusvlei area.
- b) Prepare good quality information in different forms (posters, brochures, reports, maps, newsletters, displays, booklets, DVDs, website, etc.), that is made available to visitors, staff and the general public.
- c) Ensure that research carried out in the NNA and other parts of the Park is translated into accessible information for the lay person.

- d) Engage local communities, schools, youth groups and decision-makers in ongoing activities, e.g. monitoring, and organize field excursions into key area of the NNA, including a visit to the Information Centre.
- e) Ensure that tour guides are well trained at national and local levels, and that they create exceptional field experiences for tourists by sharing their knowledge in interesting and stimulating ways.

3.13.4 Actions	Timing	Record of progress
1. Establish an open air Museum and Information Centre, preferably near Sessriem / Sossusvlei	2010-2011	
2. Compile good quality information on different aspects of the geology, ecology, archaeology, etc. of the NNA and from this, prepare materials for the dissemination of key information	Ongoing	
3. Produce small information boards for strategic placement at key sites	2009 and ongoing	
4. Produce maps and special information sheets on aspects such as off-road driving, areas open to quad bikes and expected etiquette, duties and responsibilities of Honorary Wardens, info on the Environmental Hot-Line, etc.	2008 - 2010	
5. Set standards for tour guides - both procedural (e.g. track etiquette) and technical (environmental knowledge, etc), as well as social (tourism interaction skills) - at both the NNA and Park levels.	2009-2011	

Notes:.....

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3.14 Development Guidelines

3.14.1 Principle: All management and development decisions and activities within the NNA and the Namib-Skeleton Coast National Park will be based on the principle of Sustainability and on the Precautionary and Polluter Pays Principles.

3.14.2 Vision: All developments and activities within the NNA and the Park will be guided by the sensitivity of the environment and by the unique and unusual opportunities that the environment offers for innovative developments and activities.

In addition, such developments and activities will be conducted in an environmentally sensitive manner according to best available practices as required by national law, international standards and high environmental principles and ethics.

3.14.3 Strategies:

- a) Foster an environment in which all players (MET & MFMR staff, other ministries and parastatals, local communities, business operators and visitors) are encouraged to be innovative and fully committed to the highest ideals of sustainable development, ecosystem and landscape integrity, and to create the lightest possible "footprint".
- b) Apply best environmental practices, including existing and evolving EIA and strategic assessment approaches to all developments in the NNA that are likely to have a significant impact.
- d) Apply Namibia's Eco-Awards guidelines and criteria to the development and management of all tourism initiatives and developments - both infrastructure and activities.
- e) Develop a list of priority issues (e.g. prospecting and mining, road development, tourism activities, waste disposal, water use) for which specific guidelines (policies) should be systematically developed, and ensure that they are fully understood and implemented by relevant staff and stakeholders.

3.14.4 Actions	Timing	Record of progress
1. Locate, be familiar with and use best practice policies and guidelines, including strategic	2009 and ongoing	

3.15 Rehabilitation

3.15.1 Principle: Natural landscapes and biodiversity are, as far as possible and practical, reestablished to their pristine condition or in line with agreed future land use.

3.15.2 Vision: To remove all unnecessary evidence of human occupation from the Park, except agreed infrastructure e.g. Topnaar settlements, historic mining sites, and to rehabilitate landscapes and biodiversity, using best available practices, with emphasis on those areas of greatest ecological and aesthetic importance.

3.15.3 Strategies:

- a) Commission a rehabilitation plan based on an inventory and criteria (log of areas, prioritization, costs and timelines) for the NNA.
- b) Identify responsibilities for rehabilitation - both technical and financial responsibilities.
- c) MET and other relevant parties, including designated organizations entrusted or employed to do this work, to systematically implement rehabilitation in areas and on aspects of respective responsibilities, to agreed standards and levels, starting with the affordable priorities.

3.15.4 Actions	Timing	Record of progress
1. Commission a rehabilitation plan	Start in 2010	
2. Identify responsibilities for rehabilitation	Completed during 2010	
3. Implement rehabilitation in areas and on aspects of respective responsibilities, starting with the affordable priorities and using job-creating opportunities where possible.	2011 and ongoing	

Notes:

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3.16 Financing

3.16.1 Principle: A significant component of the financial resources required to effectively implement this MDP are raised from within the NNA through levies, concession fees, fines, donations and other sources. These funds are held, administered and deployed under the local control of the Consultative Forum, using transparent and accepted accounting practices.

3.16.2 Vision: To raise, administer and apply funds for the implementation of this MDP. This would include:

- exploring and implementing appropriate mechanisms for resource collection and mobilization,
- establishing and implementing financial administration and management systems under the jurisdiction of the Consultative Forum and applying transparent and accepted accounting practices,
- establishing procedures for the Consultative Forum to review, discuss and approve fund deployment for legitimate activities towards the implementation of the MDP,
- reporting on funds received and expended, and on the outputs, outcomes and impacts of the actions funded.

3.16.3 Strategies:

- a) Initiate a discussion between MET, MFMR, Ministry of Finance and representatives of the Consultative Forum on mechanisms to raise, hold, administer, manage and apply funds, within the control of the Consultative Forum, for the implementation of the MDP.
- b) Based on the outcome of the above, establish the necessary financial management procedures, accounts and processes required to ensure good transparent financial accounting and reporting.

3.16.4 Actions	Timing	Record of progress
• Initiate a discussion with MoF on procedures for raising, holding, administering and applying funds locally for this MDP.	Start in mid 2009	
• Plan next steps based on the	Following on	

outcomes of the above discussions	from above	
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Part 4: Record keeping

4.1 Annual work plans

Each year's work plan must be filed under this section.

The annual work plan consists of a simple matrix that states:

- What should be done
- When should it be done, and
- Who should do it

These activities are derived from the MDP and follow the sequence of actionable topics under Part 3. They are best divided into five categories

- *Routine management issues,*
- *Development issues,*
- *Monitoring requirements,*
- *Research priorities and*
- *Administration of work plan*

Namib-Naukluft Area of the Namib-Skeleton Coast National Park													
Annual Work Plan for 20 __ __													
Activities	J	F	M	A	M	J	J	A	S	O	N	D	Responsible
Routine management													
1.													
2.													
3.													
4.													
Etc.													
Development issues													
1.													
2.													
3.													
4.													
Etc.													
Monitoring aspects													
1.													
2.													
3.													
Etc.													
Research priorities													
1.													
Etc.													
Administration of work plan													
1. Park CF meeting - progress report		*					*				*		Committee
2. Adopt w/plan & budget for next year											*		Committee
3. Annual technical report from past year		*											Committee
4. Annual monitoring report (feed into w/p)		*					*				*		Committee
5. Etc.													

4.2 Annual budget

Based on a "zero budget" approach, and aimed at making maximum sustained impact in most cost effective and efficient ways. The budget should closely follow the contents of the Annual Work plan. It essentially aims to allocate financial resources to ensure that the work plan is effectively implemented. A standard budget format should be developed that allows for smooth and simple integration with the budgets for other Parks in the region, and then at the national level.

An example of an annual budget for the NNA is shown below:

Namib-Naukluft Management Area of the Namib-Skeleton Coast National Park				
Annual budget for 20 _ _				
Budget line items	Unit cost (N\$)	No. Units	Total (N\$)	Notes
1. Staff remunerations				
1.1 Park Warden				
1.2 Chief ranger	Xxx/month	12 + 1		1
1.3 Rangers x 3	Yyy/month	12 + 1		2
1.4 Labourer x 3	Zzz/month	36 + 3		3
1.5 Casual labour	Aaa hours	Bb hours		4
1.6 Social Security				5
1.7 Medical aid				6
1.8 Rations				7
1.9 etc				8
1.10 Consultancy services	Xxx/days	Yy days/yr		9
2. Transport				
2.1 Vehicle fuel	Xxkm/mnth@yy/km	12		10
2.2 Vehicle maintenance				11
2.3 Licence, etc,				12
3. Equipment				
3.1 Chainsaw	xxx	1		13
3.2 etc				14
4. Building materials				
4.1 Cement				15
4.2 etc				16
5. Co-management support				
6. Monitoring				
7. Research				
6. Information sharing and dissemination				
7. Rehabilitation				
8. Administration				

Comprehensive notes should accompany the budget so that a person not familiar with the NNA would understand the logic of how resource allocation has been determined and calculated

No.	Budget Notes
1	
2	
3	
4	
Etc	

A copy of each annual budget should be filed under this section.

Agendas and Minutes of Strategic NNA Forum meetings

The agenda and minutes of each Strategic Forum meeting, plus the Terms of Reference for this Body, must be filed under this section.

Agendas and Minutes of practical NNA Consultative Forum meetings

The agenda and minutes of each practical NNA Consultative Forum meeting, plus the Terms of Reference for this Forum, must be filed under this section.

Annual reports

Each annual report for the NNA should be filed under this section.

Amendments/changes to the NNA MDP

Any changes to Parts 1-4 of the MDP must be recommended at a formal NNA Consultative Forum meeting and approved by the NNA Strategic Forum at a formal meeting, and such changes must be formally reflected in the minutes. Copies of the relevant sections of the minutes must be filed under this section of the Plan.

All changes must be entered into the "Record of Management Plan Updates" (see table below) and the amended section(s) circulated to the people/offices listed below, with a completed Record of Management Plan Updates form.

Update number	Date	Page/s removed	Page/s inserted
1			
2			
3			
4			
5			

Original copies of the MDP

The following will be provided with original copies of the MDP and its updates:

- NNA Wardens and staff
- Chief Warden, Namib-Skeleton Coast National Park
- Central Namib Management Area
- Skeleton Coast Management Area
- Sperrgebiet Management Area
- Parks Deputy Director, Windhoek
- Parks & Wildlife Director, Windhoek
- MET Library, Windhoek
- Office of the MET PS, Windhoek
- Offices of the PSs of MME, MFMR, MLR, MAWRD, MLRGHRD
- Office of the MET Deputy Minister, Windhoek
- Office of the MET Minister, Windhoek
- MME offices (Swakopmund / Central Coast & Luderitz)
- Geological Survey
- MLR office (Swakopmund / Central Coast & Luderitz)
- MFMR (Swakopmund & Luderitz / Central Coast)
- Office of the Governor - Hardap and Councilors
- Chamber of Commerce & Industry
- FENATA
- Gobabeb Training and Research Centre
- Relevant NGOs
- Topnaar Community
- Any other stakeholder that requests a copy
- Pdf copy on the MET website

Part 5: Inventories and background information

This is a very dynamic part of the MDP, and should be added to and updated as information becomes available. The following topics, which may be added to, are relevant:

- 5.1 Geographic location, coverage and topography (maps)
- 5.2 Climate
- 5.3 Geology & geomorphology
- 5.4 Paleontology
- 5.5 Hydrology
- 5.6 Ephemeral river systems, vleis and pans
- 5.7 Ground water
- 5.8 Broad habitats
- 5.9 Flora
- 5.10 Mammals
- 5.11 Birds
- 5.12 Reptiles
- 5.13 Amphibians
- 5.14 Fishes
- 5.15 Coastal and marine fauna
- 5.16 Terrestrial invertebrates
- 5.17 Endemic species and patterns of distribution
- 5.18 Red Data species
- 5.19 Alien species
- 5.20 Archaeology
- 5.21 History
- 5.22 Land use, past and present
- 5.23 Infrastructure
- 5.24 Administration
- 5.25 Legal issues

Information for this section should be obtained opportunistically, by Park staff, informed visitors, by attracting visiting scientists, and by working with universities and other interested organisations and individuals.

New information may have management implications. Such information, where relevant, should be tabled at NNA Consultative Forum meetings. New information may lead to recommendations for changes in aspects of monitoring and management.

Part 6: Studies and reports

This is also a dynamic part of the MDP. As the results of studies, reports and publications on the NNA and relevant adjacent areas and topics are completed and become available, their full citation should be listed here, with author, date, title and reference. Copies of the reports and publications should be kept at:

- a) The MET library in Windhoek,
- b) The Park HQ of the Namib-Skeleton Coast National Park, and
- c) The NNA head office.

List of Reports and Publications from and relevant to, the CA of the Namib-Skeleton Coast National Park				
No.	Author(s)	Date	Title	Reference
1				
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Regulations

Preamble

These regulations specify what is permitted or not permitted in the Namib-Naukluft Area (NNA) of the Namib-Skeleton Coast National Park (NSCNP) (hereinafter referred to as 'the park'). They are a compliment to the Management and Development Plan (MDP) of the NSCNP. Thus, an issue not included in the regulations, but covered in the MDP, is in such cases regulated by the text in the MDP.

A. Public Access

1. Any person entering the NNA of the NSCNP does so wholly at his/her own risk. Thus, the Government of the Republic of Namibia shall not be liable for any damage suffered on account of physical injury, whether fatal or not, incurred in any way whatsoever in the park.
2. Unless permitted through a concession agreement authorized by the Minister, bikes and quad bikes may only access the following areas:
 - a. Any proclaimed road, subject to the relevant Traffic Ordinance and regulations,
3. Unless permitted through a concession agreement, beach buggies and motor vehicles may only access the following areas:
 - a. Any proclaimed or park road, subject to the relevant Traffic Ordinance and regulations,
 - b. Designated 4x4 trails in and immediately adjacent to the Naukluft mountains.
3. Walking and jogging is permitted in designated areas in the park (e.g. Sossusvlei, Naukluft mountains) under specific conditions. No pets may accompany the owner anywhere in the park.
4. Aircraft, microlights and gliders may overfly the NNA providing they are above 3000 feet in the Tsondabvlei area and 1000 feet anywhere else, and that all Civil Aviation laws and regulations are conformed with. Aircraft may only land on registered airfields, unless a forced landing is required in an emergency, in which case the required Civil Aviation procedures must be followed.
5. Overnighting in the NNA is only permitted in designated campsites and lodges.

6. Fires may only be made in designated fireplaces.
7. Bonfires and fireworks may not be made/discharged anywhere in the NNA.

B. Signage, advertising and structures

1. Only the Government of the Republic of Namibia (GRN) and legal entities duly authorized by them to do so may erect signs in the park, and all signs shall conform to the standards specified by the Namibian Roads Authority (NRA) or agreed by them.
2. Billboards or outdoor advertising of any kind are/is explicitly prohibited.

C. Tourism and Concessions

1. No one may offer accommodation, tours or special events in the NNA unless they have a valid concession or permit authorized by the Minister and issued by the Permanent Secretary of MET.
2. No lodge or campsite may be established in the NNA without a valid concession or permit authorized by the Minister and issued by the Permanent Secretary of MET and unless its establishment has been guided by either an Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP), or a fast-track EMP should MET decide that an EIA is not necessary. In any event, there must be a competent Environmental Contract that stipulates the environmental safeguards that must be complied with.
3. The GRN may issue concessions in the NNA consistent with this MDP and in accordance with the MET's tourism and concession policies.
4. No person may make any film or photo for commercial purposes in the NNA without the written permission of the Park Authorities.
5. Without the written permission of the Park Authority, no person, except an officer acting in an official capacity, may
 - a. present public entertainment,
 - b. collect money from the public,
 - c. carry out any trade or business,
 - d. distribute any pamphlet, book, handbill or any other printed or written document, or
 - e. organize, hold or address any meeting or assembly, or

6. In all cases, conditions will be stipulated for the concession and these must be adhered to.

D. Plant and animal harvesting

1. Unless explicitly allowed by virtue of a valid permit, no-one may harvest any plant or animal for commercial purposes in the park
2. Angling, fishing and crayfishing is not permitted anywhere along the coast in the NNA.
3. No bait and shellfish may be harvested anywhere along the coast in the NNA.
4. Beach-combing is permitted by guests on tour in concession areas, providing that the intention is to collect items for personal use only, and that items are collected by hand only.
5. No marine mammals may be harvested or disturbed.
6. Other than the above, no animal may be killed, chased, baited or harassed, and no eggs may be removed from a nest, nor may the nest be tampered with or damaged.

E. Prospecting and mining

1. Prospecting and mining for strategic minerals only, will be permitted in the park, and then only in areas where they will not unduly undermine conservation priorities, i.e. nowhere in a zone categorized as a Strict Nature Reserve (IUCN category 1a), a Wilderness Area (IUCN category 1b) and a Monument (IUCN category 3), not in the intertidal zone, not within 5 km's of Damara tern nesting sites, Penguin and Seal colonies, not in or within 5km's of the Naukluft Mountains and/or public recreation and tourism (i.e. not within 5km's of any lodge or public campsite).
2. All prospecting and mining will be preceded by an EIA and EMP, in accordance with Namibia's Environmental Management Act of 2007, and the relevant mining legislation.
3. All mines must be rehabilitated after closure or abandonment, in accordance with the Environmental Management Act of 2007.

F. Industries

1. Given that the park is surrounded by various forms of development, e.g. farmlands, tourism activities, it is acceptable that certain activities and infrastructure required to satisfy national and/or public interest, may be located in or immediately adjacent to the park. Examples include roads, power lines, pipelines, tourism facilities and activities, and research facilities.
2. In all such cases, future developments will be preceded by an EIA and EMP, in accordance with Namibia's Environmental Management Act of 2007. If past developments are of concern, they may be subject to an environmental audit, which may result in changes being required and an EMP.
3. Notwithstanding 1 and 2 above, no person may erect or lay out any building, structure, water installation, fence, seaward protection, beach wall, boat house landing place, nursery, borehole, trench or any other works or facilities without the written permission of the Park Authority.

G. Waste, pollution and litter

1. Any form of littering is illegal. 'Littering' in this case means discarding or leaving a human-made object or food item in the park or on or adjacent to a public road running through the park. 'Leaving' in this case means going away from the place or area where the item was left by the person, whether or not the person intended returning to fetch it later.
2. Any form of environmental defacing is illegal. 'Defacing' in this case means painting, scratching, writing or spraying names, patterns or motifs on any part of nature or creating new vehicle tracks on the unspoilt desert environment.
3. No waste disposal site may be created in the park unless authorized in writing by the MET, and then with clear directives on how the waste must be managed, applying best available practices.
4. Should a person have no alternative than to use nature as a 'toilet', the toilet paper must either be burnt or removed, and the human waste buried or removed.
5. No person may pollute the soil, ocean or freshwater in any manner.

H. Honorary Wardens

Honorary Wardens will be appointed to assist the GRN in managing the park, and shall have the following responsibilities and powers:

1. To provide information to the public and other stakeholders
2. To inform people that they are in contravention of the regulations, and request them to immediately comply
3. To stop a person and search a vehicle, boat or aircraft, providing there is a reasonable suspicion that the person has been involved in an illegal activity
4. To demand a persons name (as above)
5. To inspect a suspects luggage (in search of any illegal items, such as fish, shellfish, bait, venison, live animals, plants, etc.)
6. To count and/or measure fish or shellfish to determine if they comply with legal requirements
7. To issue an offender with an official warning.
8. To report an offender to the authorized law enforcement agencies, whose task it is to perform an arrest/issue a fine, as the case may be.

I. Powers of an Officer

An officer shall have all the powers accorded to Honorary Warden, as well as the following additional powers:

1. An officer who performs duty in the park may order a person who, in his/her considered opinion commits or has committed an offence, or does or has done anything which gives offence or has given offence to other people in the park, to leave the park forthwith.
2. Any person who has been lawfully ordered by an officer to leave the park in accordance with 1, above, shall leave the park forthwith along the shortest route on which the public may travel.
3. If the Park Authority decides that the person evicted from the park in accordance with 1, above, is a threat to the park or the public in the park, s/he may order that the person may not re-enter the park for a period of 6 months.
4. Any person banned from entering the park in accordance with 3, above, may appeal his/her ban in writing. The appeal will be considered by the Permanent Secretaries of MET and MFMR, and the decision conveyed by them in writing to the appellent.
5. An officer who performs duty in the park may warn, fine or arrest a person who, in his/her considered opinion has contravened any of the park regulations. In the case of a fine, the amount to be fined shall be made known in the Government

Gazette from time to time. If the contravention was damage to State property, the officer may issue a fine that is in relation to the costs of repairing or replacing, as the case may be, the damaged property.

6. An officer who performs duty in the park may confiscate from any person an object that has been used to contravene any of the park regulations, or an item that constitutes evidence of the contravention, when s/he issues a fine to the person for the contravention, or arrests the person, as the case may be. The officer shall issue the person a confiscation receipt for the item and shall be responsible for its safekeeping until the case is heard by a competent Court. The Court shall decide whether the item be forfeited to the State or returned to the person.

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Annex 21

Bibliography



Namib Sand Sea Bibliography - 2011

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Alien biota

- Bethune S, Griffin M, Joubert D. 2004. National review of invasive alien species: Namibia. DEA: MET, Windhoek, 153 pp.
- Boyer DC 1989. Invasive alien plants in areas of the Namib-Naukluft Park disturbed by man. *Madoqua* **16**(2): 137-139.
- Boyer DC, Boyer HJ. 1989. The status of alien invasive plants in the major rivers of the Namib Naukluft Park. *Madoqua* **16**(1): 51-58.
- Brown CJ, Gubb AA. 1986. Invasive alien organisms in the Namib Desert, Upper Karoo and the arid and semi-arid savannas of western southern Africa. In: *The Ecology and Management of Biological Invasions in Southern Africa – proceedings of the National Synthesis Symposium on the ecology of biological invasions*, IAW Macdonald, JJ Kruger and AA Freerar (Eds), Oxford University Press, Cape Town: 93 – 108.
- Henschel JR, Parr T. 2010. Population changes of alien invasive plants in the Lower Kuiseb River. *Dinteria* **31**: 5-17.
- Jabs C. 1991. Alien invasives in the Kuiseb River, Namib Desert, Namibia. BSc. University of Oxford, Oxford: 43 pp.
- Van Zyl BJ, Hay CJ, Steyn GJ. 1991. The successful introduction of *Oreochromis mossambicus* in salt pans along the Namib coast. *Madoqua* **19**(2): 87-89.
- Vinejevoled RD, Bridgeford P, Yeaton D. 1985. Invasive alien plants in the Namib-Naukluft Park. In: CJ Brown, IAW Macdonald, SE Brown. *Invasive alien organisms in South West Africa/Namibia*. South African National Scientific Programmes Report, CSIR, Pretoria, RSA, No 119: 24 -27.

Archaeology, palaeontology and history

- Africa Pilot. 1977. Admiralty Sailing Directions. Africa Pilot Volume II. Twelfth Edition, 248 pp.
- Alexander JE. 1838. An expedition of discovery into the interior of Africa. 2 Volumes. Facsimile reprint 1967. Cape Town: C. Struik.
- Axelson E. 1973. Congo to Cape. Early Portuguese Explorers. Faber & Faber, London.
- Axelson E. 1988. The Dias Voyage, 1487-1488: Typonymy and padrões. *Revista de Universidade de Coimbra* 34: 29-55.
- Baerike ME. 2007. Lüderitzbucht. Namibia Scientific Society, Windhoek, 187 pp.
- Bennett MR, Liutkus CM, Thackeray F, Morse S A, McClymont J, Stratford D. 2010. Footprints of the Kuiseb delta, Namibia. *The Digging Stick* 27(3): 1- 4.
- Budack K. 1977. The Aonin or Topnaar of the Lower !Kuseb Valley and the Sea. *Khoisan Linguistic Studies* 3: 1-42.
- Cooper A. 1982. US Economic power and political influence in Namibia 1750 – 1982. Boulder: Westview.
- Freundlich JC, Schwabedissen H, Wendt WE. 1980. Köln radiocarbon measurements II. *Radiocarbon* 22(1): 68-81.
- Gockel M. 2000. Diversifizierung und politische Ökonomie der Damara im 19. Jahrhundert. In: Möhlig, W (Ed), *Frühe Kolonialgeschichte Namibias, 1880-1930*. Cologne: Koppe.
- Green J. 1990. Maritime Archaeology. A Technical Handbook. Academic Press. London, 282 pp.
- Green L. 1933. The Coast of Treasure. Cape Town, Timmins.
- Hamilton WR, van Couvering JA. 1977. Lower Miocene mammals from South West Africa. *Namib Bulletin, Gobabeb*: 9-11.
- Honeyborne P. 2003. Gateway to Adventure. Gamsberg MacMillan, 233 pp.
- Jacobson L, Vogel JC. 1977. Radiocarbon dates for a shell midden complex from Wortel, Walvis Bay. *Madoqua* 10(1): 85-86.
- Kinahan, J.H. 1988. The Pillar in the Mist: a History of the Dias Padrao at Lüderitz. National Monuments Council, Windhoek, 509 pp.
- Kinahan JH. 1990. The impenetrable shield: HMS Nautilus and the Namib coast in the late eighteenth century. *Cimbebasia* 12: 23-61.
- Kinahan JH. 1991. The historical archaeology of nineteenth century fisheries at Sandwich Harbour on the Namib Coast. *Cimbebasia* 13: 1-27.
- Kinahan J. 1991. Pastoral Nomads of the Central Namib Desert: The people history forgot. Cape Town: Associate Printing, 167 pp.
- Kinahan JH. 1992. By Command of their Lordships. The exploration of the Namibian Coast by the Royal Navy, 1795-1895. Namibia Archaeological Trust, Windhoek, 216 pp.
- Kinahan J. 1996. Human and Domestic Animal Tracks in an Archaeological Lagoon Deposit on the Coast of Namibia. *The South African Archaeological Bulletin* 51(164): 94-98.
- Kinahan J. 1996. The archaeology of social rank among eighteenth century nomadic pastoralists in southern Namibia. *African Archaeological Review* 13(4): 225-45.
- Kinahan JH. 2000. Cattle for beads: The archaeology of historical contact and trade on the Namib Coast. *Studies in African Archaeology* 17. Sweden: Uppsala University Press.
- Kinahan J. 2001. Pastoral Nomads of the Namib Desert. Namibia Archaeological Trust, Windhoek, 167 pp.
- Kinahan J, Kinahan JH. 2006. Preliminary report on the late Holocene archaeology of the Awasib-Gorrasis Basin Complex in the southern Namib Desert. *Studies in the African Past* 5:1-14.
- Kinahan J, Kinahan JH. 2009. A thousand fine vessels are ploughing the main: archaeological traces of nineteenth century “Guano Rage” on the south-western coast of Africa. *Australian Historical Archaeology* 27: 43-54.
- Kinahan J, Pallett J, Vogel J, Ward J, Lindeque M. 1991. The occurrence and dating of elephant tracks in the silt deposits of the lower !Kuseb River, Namibia. *Cimbebasia* 13: 37-43.
- Kinahan J, Vogel JC. 1982. Recent copper-working sites in the !Kuseb drainage, Namibia. *South African Archaeological Bulletin* 37: 44-45.
- Mourer-Chauviré C, Senut B, Pickford M, Mein P. 1996a. Le plus ancien représentant du genre *Struthio* (Aves, Struthionidae), *Struthio coppensi* n. sp. Du Miocène inférieur du Namibie. *Comptes Rendus de l'Académie des Sciences, Paris*, 322, 325-332.

- Mourer-Chauviré C, Senut B, Pickford M, Mein P, Dauphin Y. 1996b. Ostrich eggs, legs and phylogenies. *S. Afr. J. Sci.* **92**: 491-495.
- Noli D. 1989. *An archaeological investigation of the Koichab River region of the southwestern Namib Desert centred activities on the Holocene hunter-gatherers*. MSc Thesis, University of Cape Town.
- Noli D. 2005. A listing and discussion of the known archaeological sites of the Sperrgebiet and its adjacent areas. Unpublished report.
- Noli G. 2010. *Desert Diamonds*. Knysna Press, 114 pp.
- Pickford M. 2000. Fossil spider's webs from the Namib Desert and the antiquity of *Seothyra* (Araneae, Eresidae). *Annales de Paléontologie* **86**: 147-155.
- Pickford M. 2008. Arthropod bioconstructions from the Miocene of Namibia and their palaeoclimatic implications. *Memoir of the Geological Survey of Namibia* **20**: 53-64.
- Pickford M. 2009. New ratite eggshells from the Miocene of Namibia. *Communications of the Geological Survey of Namibia* **14**: 55-71.
- Pickford M, Senut B. 1999. Geology and palaeobiology of the Namib Desert. *Mem. Geol. Surv. Namibia* **18**: 155 pp.
- Pickford MFH, Senut B, Dauphin Y. 1995. Biostratigraphy of the Tsondab sandstone (Namibia) based on gigantic avian eggshells. *Geobios* **28**: 85-98.
- Potgieter C. 1969. *Skipbreuke aan ons kus*. Nasionale Handelsdrukkery, Kaap, 220 pp.
- Rudner J. 1981. The legal protection of historical shipwrecks in South Africa. *Southern African Museums Association Bulletin* **14**: 317-320
- Sandelowsky BH. 1976. An ancient butchery site in the dunes of the Namib. *South West African Annual*, Windhoek: 117-120.
- Sandelowsky BH. 1976. The beginning of archaeo-ethno-botany in the Namib. In: *Palaeoecology of Africa & of the surrounding islands & Antarctica*. Van Zinderen Bakker, EM (Editor) AA Balkema, Rotterdam: 136-143.
- Sandelowsky BH, Scholz H, Ahlert K. 1976. Ancient tracks near Tsondab Vlei. *Madoqua* **9**: 57-58
- Sandelowsky BH. 1977. Mirabib – an archaeological study in the Namib. *Madoqua* **10**(4): 221-283.
- Sandelowsky BH, Van Rooyen JH, Vogel JC. 1979. Early evidence for herders in the Namib. *South African Archaeological Bulletin* **34**: 50-51.
- Schneider GIC. 2009. *Treasures of the Diamond Coast*. MacMillan Education Namibia, Windhoek, 320 pp.
- Seely MK. 1981. Namib dune archaeology. *South African Archaeological Society Newsletter* **4**(2): 2-3.
- Seely MK, Sandelowsky BH. 1974. Dating the regression of a river's end point. *South African Archeological Bulletin*, Goodwin Series: 61-64.
- Ségalen L, Renard M, Pickford M, Senut B, Cojan I, Le Callonec L, Rognon P. 2002. Environmental and climatic evolution of the Namib Desert since the Middle Miocene: the contribution of carbon isotope ratios in ratite eggshells. *Comptes Rendus Geoscience* **334**: 917-924.
- Senut B. 2000. Fossil ratite eggshells: a useful tool for Cainozoic stratigraphy in Namibia. *Communs geol. Surv. Namibia* **12**: 367-373.
- Senut B, Dauphin Y, Pickford M. 1998. Nouveaux restes aviens du Néogène de la Sperrgebiet (Namibie): Complément à la biostratigraphie avienne des éolianites du désert de Namib. *Comptes Rendus de l'Académie des Sciences, Paris* **327**: 639-644.
- Senut B, Pickford M. 1995. Fossil eggs and Cenozoic continental biostratigraphy of Namibia. *Palaeontologica Africana* **32**: 33-37.
- Senut B, Pickford M, Dauphin Y. 1995. Découverte d'oeufs de type « aepyornithoïde » dans le Miocène inférieur de Namibie. *Comptes Rendus de l'Académie des Sciences, Paris* **320**: 71-76.
- Senut B, Pickford M, Ségalen L. 2009. Neogene desertification of Africa. *Comptes Rendus Geoscience* **341**: 591-602.
- Senut B, Pickford M, Ward J. 1994. Biostratigraphie de éolianites néogènes du Sud de la Sperrgebiet (Désert de Namib, Namibie). *Comptes Rendus de l'Académie des Sciences* **318** : 1001-7.
- Shackley ML. 1980. An Achaulean site with *Elephas recki* fauna from Namib IV, South West Africa/ Namibia. *Nature* **284**: 340-1.
- Shackley M. 1982. Namib IV and the Acheulean technocomplex in the central Namib Desert (South West Africa). In: *Palaeoecology of Africa and the surrounding islands*. Volume 15. Coetzee JA, van Zinderen Bakker EM Sr. (Editors) AA. Balkema, Rotterdam: 151-158.

- Shackley ML. 1983. Human burials in hut circles at Sylvia Hill, South West Africa/Namibia. *Cimbebasia* (B) **2**: 102-106.
- Shackley ML. 1984. Off-site distribution and artefact visibility in the central Namib Desert, South West Africa/Namibia. *Cimbebasia* (B) **4**: 51-58.
- Shackley M. 1984. #hing - #hais: an early stoneworking site from the central Namib Desert. *Madoqua* **13**: 271-279.
- Shackley ML. 1985. Paleolithic archaeology of the Central Namib Desert: A preliminary survey of chronology, typology and site location. *Cimbebasia Memoir* **6**. Windhoek: State Museum, 1-84.
- Smith AB, Kinahan J. 1984. The invisible whale. *World Archaeology* **16**(1): 89-97.
- Speich R. 2010. Sie bauten, doch sie blieben nicht: Zur Steinkreisarchitektur der einstigen Wanderhirten in der Namib. Windhoek: Klaus Hess Verlag, 144 pp.
- Starbuck A. 1989. History of the American whale fishery. Castle Books, 779 pp.
- Vigne R, 1991. James Archbell's Beschrijving der Walvischbaai en omliggende plaatsen aan de westkust van Afrika in 1823: an English translation with introduction and notes. *Cimbebasia* **13**: 29-36.
- Vigne R. 2000. The hard road to colonization: The Topnaar Aonin of Namibia, 1670-1878. *Journal of Colonialism and Colonial History* 1-2.
- Van Zinderen Bakker EM. 1975. The origin and palaeoenvironment of the Namib Desert biome. *Journal of Biogeography* **2**: 65-73.
- Van Zinderen Bakker EM. 1977. Palynological research on the origin of the Namib Desert. *Namib Bulletin*, Gobabeb: 8.
- Van Zinderen Bakker EM. 1984. Aridity along the Namibian coast. In: *Palaeoecology of Africa and the surrounding islands*. Volume 16. Coetzee JA, van Zinderen Bakker EM Sr. (Editors) AA Balkema, Rotterdam: 149-160.
- Vogel JC. 1982. The age of the Kuiseb River silt terrace at Homeb. In: *Palaeoecology of Africa and the surrounding islands*. Coetzee JA, van Zinderen Bakker EM Sr. (Editors) AA Balkema, Rotterdam: 201-210.
- Vogel JC. 1989. Evidence of past climatic change in the Namib Desert. *Palaeogeography, Palaeoclimatology, Palaeoecology* **70**: 355-366.
- Vogel JC. 2003. The age of dead trees at Sossusvlei and Tsondabvlei, Namib Desert, Namibia. *Cimbebasia* **18**: 247-251.
- Vogel JC, Rogers J, Seely MK. 1981. Ancient climates and the age of the Namib. *South African Journal of Science* **77**: 435-436.
- Wendt WE. 1972. Preliminary report on an archaeological research programme in South West Africa. *Cimbebasia* (B) **2**: 1-61.

Atmosphere

- Annegarn HJ, van Grieken RE, Bibby DM, von Blottnitz F. 1983. Background aerosol composition in the Namib Desert, South West Africa (Namibia). *Atmospheric Environment* **17**: 2045-2053.
- Annegarn HJ, van Grieken RE, van Espen P, von Blottnitz F, Winchester JW, Maenhaut W. 1978. Background aerosol composition at Gobabeb, South West Africa. *Madoqua* **11**: 107-118.
- Anonymous. 2007. Gobabeb, Namibia NOAA ESRL GMD carbon cycle. *NOAA ESRL Global Monitoring Division*. Boulder, Colorado: 1-3.
- Conrad R, Seiler W. 1982. Arid soils as a source of atmospheric carbon monoxide. *Geophysical Research Letters* **9**: 1353-1356.
- Eltayeb MAH, Van Grieken RE, Maenhaut W, Annegarn HJ. 1993. Aerosol-soil fractionation for Namib Desert samples. *Atmospheric Environment* **27A**: 669-678.
- Feig GT. 2009. *Soil biogenic emissions of nitric oxide from arid and semi-arid ecosystems*. PhD Thesis. Johannes Gutenberg-Universität, Mainz: 222 pp.
- Günther A. 1995. Untersuchungen zum Mischungsverhältnis von Ammoniumsalz-Aerosol und Ammoniak im atmosphärischen Mehrphasensystem. Diploma. Johann Wolfgang Goethe-University, Frankfurt/Main: 77 pp.
- Nott K, Savage MJ. 1985. Radiation measurements from the Namib Desert. *Madoqua* **14**: 165-172.
- Savage MJ, Nott K, McClain E. 1984. Spectral radiation in and above Namib dune sand. *South African Journal of Science* **80**: 182-183.

Biodiversity

- Arnold EN. 1990. Why do morphological phylogenies vary in quality? An investigation based on the comparative history of lizard clades. *Proceedings of the Royal Society, London B* **240**: 135-172.
- Arnold EN. 1991. Relationships of the South African lizards assigned to *Aporosaura*, *Meroles* and *Pedioplanis* (Reptilia: Lacertidae). *Journal of Natural History* **25**: 783-807.
- Atmore JD. 1985. *Phylogenetic relationships among beetles within the genus Onymacris (Coleoptera: Tenebrionidae): a phenetic versus cladistic approach*. MSc. University of Cape Town, Department of Zoology, Cape Town: 73 pp.
- Barnard P. (ed.) 1998. Biological Diversity in Namibia: a country Study. Namibia Biodiversity Task Force. MET, Windhoek: 332 pp.
- Barnard P, Henschel J. 2002. Monitoring, predicting & adapting to environmental change - a framework for applying SoER indicators through EONN. Proceedings: Environmental Monitoring and Indicators Network. Ministry of Environment and Tourism, Department of Environmental Affairs, Midgard Lodge: 39-44.
- Beier M. 1962. Pseudoscorpioniden aus der Namib-Wüste. *Annals of the Transvaal Museum, Pretoria* **24**: 223-230.
- Bellamy CL, Holm E. 1985. Studies in the African Agrilinae, Coraebini I & II (Coleoptera; Buprestidae). *Journal of the Entomological Society of Southern Africa* **48**: 121-134.
- Boycott RC, Haacke WD. 1979. Note on the type-locality, distribution and juvenile coloration of *Naja nigricollis woodi* (Serpentes: Elapidae) and an account of the colour-pattern variation in intergrade populations. *Annals of the Cape Provincial Museum* **13**: 31-38.
- Brain CK. 1962. A review of the gecko genus *Ptenopus* with the description of a new species. *Cimbebasia* **1**: 1-18.
- Brown HD. 1962. The male *Crypsicerus cubicus* Saussure, 1888 (Orthoptera: Lathiceridae). *Journal of the Entomological Society of South Africa* **25**: 192-197.
- Brown HD. 1962. New and interesting grasshoppers from Southern Africa 2 (Orthoptera: Acridoidea). *Scientific Papers of the Namib Desert Research Station*: 3-19.
- Brown HD. 1962. New species of the genus *Acocksacris* (Orthoptera: Acridoidea). *Annals of the Transvaal Museum, Pretoria* **24**: 181-196.
- Burke A. 2006. The Sperrgebiet: managing its biodiversity. EnviroScience and Namibia Nature Foundation, Oranjemund and Windhoek: 100 pp.
- Cloudsley-Thompson JL. 1990. Arachnology of the Namib Desert dunes. *Newsletter of the British arachnological Society* **59**: 6-7.
- Cloudsley-Thompson JL. 1999. Multiple factors in the evolution of animal coloration. *Naturwissenschaften* **86**: 123-132.
- Cloudsley-Thompson JL. 2001. Ecological analogues and convergence among desert organisms. *Biogeographica* **77**: 51-63.
- Coetzee CG. 1969. The distribution of mammals in the Namib Desert and adjoining inland escarpment. *Scientific Papers of the Namib Desert Research Station*: 23-36.
- Costa G, Petralia A. 1985. Namib and Sicily: ecological and behavioural convergence in sandy ecosystems. *Namib Bulletin, Gobabeb*: 9-11.
- Craven P. 2009. *Phytogeographic study of the Kaokoveld Centre of Endemism*. Unpublished PhD, University of Stellenbosch.
- Crawford CS. 1986. The role of invertebrates in desert ecosystems. In: *Pattern and process in desert ecosystems*, Whitford WG. (Editor) University of New Mexico Press, Albuquerque: 73-91.
- Crawford CS, Mackay WP, Cepeda-Pizarro JG. 1993. Detritivores of the Chilean arid zone (27-32° S) and the Namib Desert: a preliminary comparison. *Revista Chilena de Historia Natural* **66**: 283-289.
- Crawford CS, Seely MK. 1987. Assemblages of surface-active arthropods in the Namib dunefield and associated habitats. *Revue de Zoologie Africaine* **101**: 397-421.
- Curtis BA, Mannheimer CA. 2005. Tree Atlas of Namibia. National Botanical Research Institute, Windhoek, 688 pp.
- Dippenaar-Schoeman AS. 1990. A revision of the African spider genus *Seothyra* Purcell (Araneae: Eresidae). *Cimbebasia* **12**: 135-160.
- Enders MM. 1990. Sexual selection sheds light on evolution of dimorphism. *Namib Bulletin, Gobabeb*: 3.

- Endrödy-Younga S. 1982. The evidence of Coleoptera in dating the Namib Desert re-examined. In: *Palaeoecology of Africa and the surrounding islands*. Volume 15. Coetzee JA, van Zinderen Bakker EM Sr. (Editors) AA Balkema, Rotterdam: 217-224.
- Fitzsimons V. 1962. A new worm snake (*Leptotyphlops*) from South West Africa. *Annals of the Transvaal Museum, Pretoria* **24**: 239-240.
- Griffin E, Dippenaar-Schoeman AS. 1991. A checklist of, and references to, the Namibian spider fauna (Arachnida, Araneae). *Cimbebasia* **13**: 155-181.
- Griffin M. 1990. A review of taxonomy and ecology of gerbilline rodents of the central Namib Desert, with keys to the species (Rodentia: Muridae). In: *Namib ecology 25 years of Namib research*. Seely MK (Editor) Transvaal Museum, Pretoria: 83-98.
- Haacke WD. 1963. First find of the Namib golden mole (*Eremitalpa granti namibensis*). *IUCN Bulletin* **9**: 8.
- Haacke WD. 1964. Description of two new species of lizards and notes on *Fitzsimonsia brevipes* (Fitzsimons) from the central Namib Desert. *Scientific Papers of the Namib Desert Research Station*: 1-15.
- Haacke WD. 1965. Additional notes on the herpetology of South West Africa with descriptions of two new subspecies of Geckos. *Cimbebasia* **11**: 1-39.
- Haacke WD. 1968. *A taxonomic and ecological study of the burrowing geckos of southern Africa*. MSc. University of Pretoria, Faculty of Science, Pretoria: 201 pp.
- Haacke WD. 1970. New herpetological records from South West Africa. *Annals of the Transvaal Museum, Pretoria* **26**: 277-283.
- Haacke WD. 1974. Die Bellgeckos des südlichen Afrika. *Natur und Museum* **104**: 273-279.
- Haacke WD. 1975. The burrowing geckos of southern Africa, 1 (Reptilia: Gekkonidae). *Annals of the Transvaal Museum, Pretoria* **29**: 197-243.
- Haacke WD. 1975. Herpetological investigations in the sand sea of the southern Namib. *Bulletin of the Transvaal Museum, Pretoria*: 8-10.
- Haacke WD. 1976. The burrowing geckos of southern Africa, 2 & 3 (Reptilia: Gekkonidae). *Annals of the Transvaal Museum, Pretoria* **30**: 13-39.
- Haacke WD. 1976. The burrowing geckos of southern Africa, 4. (Reptilia: Gekkonidae). *Annals of the Transvaal Museum, Pretoria* **30**: 53-70.
- Haacke WD. 1976. The burrowing geckos of southern Africa, 5 (Reptilia: Gekkonidae). *Annals of the Transvaal Museum, Pretoria* **30**: 71-89.
- Haacke WD. 1982. Distribution patterns of reptiles as indicators of geomorphological events in the Namib Desert. In: *Palaeoecology of Africa and the surrounding islands*. Volume 15. Coetzee JA, van Zinderen Bakker EM Sr. (Editors) AA Balkema, Rotterdam: 225-226 pp.
- Haacke WD. 1986. Description of a new species of *Typhlosaurus* Wiegman, 1834 (Reptilia: Scincidae) from the west coast of southern Africa, with new records of related species. *Annals of the Transvaal Museum, Pretoria* **34**: 227-235.
- Haase-Mühlner A. 1994. *Grundmuster und Evolution der Solifugen (Chelicerata, Arachnida)*. MSc. University of Hamburg, Institute and Museum of Zoology, Hamburg: 91 pp.
- Hale MEJ, Vobis G. 1978. *Santessonia*, a new lichen genus from Southwest Africa. *Botaniska Notiser* **131**: 1-5.
- Hamilton WJ III, Penrith M-L. 1977. Description of an individual possible hybrid tenebrionid beetle and the habitat preference of the parental species. *The Canadian Entomologist* **109**: 701-710.
- Harrison JDuG, Scholtz CH, Chown SL. 2010. A revision of the endemic south-western African dung beetle subgenus *Scarabaeus* (*Pachysoma*) MacLeay, including notes on other flightless Scarabaeini (Scarabaeidae: Scarabaeinae). *Journal of Natural History* **37**: 305-355.
- Heatwole H. 2001. Realized ant assemblages in the Namib, Kalahari and Kara-kum deserts. In: *Ecology of desert environments*. Prakash I (Editor) Scientific Publishers, (Jodhpur India): 301-332.
- Henschel JR, Grohmann C, Siteketa V, Linsenmair KE. 2010. Monitoring tenebrionid beetle biodiversity in Namibia. *African Study Monographs* **40**: 91-102.
- Henschel J, Klintonberg P, Roberts C, Seely M. 2007. Long-term ecological research from an arid, variable, drought-prone environment. *Secheresse* **18**(4): 342-347.

- Henschel JR, Mtuleni V, Pallett J, Seely MK. 2003. The surface-dwelling arthropod fauna of Gobabeb with a description of the long-term pitfall trapping project. *Journal of the Namibia Scientific Society* **51**: 65-92.
- Henschel JR, Pallett J, Berry C, Griffin M, Hachfeld B, Makuti O, Seely MK. 2006. Checklists of the flora and vertebrates of Gobabeb. *Journal of the Namibia Scientific Society* **54**: 31-58.
- Holm E. 1988. Environmental restraints and life strategies: a habitat template matrix. *Oecologia (Berlin)* **75**: 141-145.
- Holm E. 1990. Notes on faunas bordering on the Namib desert. In: *Namib ecology 25 years of Namib research*. Seely MK. (Editor) Transvaal Museum, Pretoria: 55-60.
- Holm E, Scholtz CH. 1980. Structure and pattern of the Namib Desert dune ecosystem at Gobabeb. *Madoqua* **12**: 3-39.
- Irish J. 1990. Namib biogeography, as exemplified mainly by the Lepismatidae (Thysanura: Insecta). In: *Namib Ecology 25 years of Namib research*. Seely MK (Editor) Transvaal Museum, Pretoria: 61-66.
- Koch C. 1950. The Tenebrionidae of Southern Africa 1: First account of the Tenebrionidae collected on the University of California-Transvaal Museum expedition, 1948. *Annals of the Transvaal Museum, Pretoria* **21**: 273-367.
- Koch C. 1952. The Tenebrionidae of Southern Africa. 12: Supplementary notes to preliminary articles Nos. I, III, V and VIII. *Annals of the Transvaal Museum, Pretoria* **22**: 79-196.
- Koch C. 1953. The Tenebrionidae of Southern Africa. 21: On some new endemic *Opatrinae* from the Namib Desert. *Annals of the Transvaal Museum, Pretoria* **22**: 231-252.
- Koch C. 1955. The fauna of the Namib Desert. *Bulletin of the Transvaal Museum, Pretoria*: 4-5.
- Koch C. 1955. The Tenebrionidae of Southern Africa. 25: New, forgotten or palaeartic genera and species of *Opatrinae*. *Annals of the Transvaal Museum, Pretoria* **22**: 419-476.
- Koch C. 1959. Die Namibdünen und ihre Tierwelt. *Der Kreis*, Windhoek: 198-200.
- Koch C. 1959. The Tenebrionidae of Southern Africa 28: On a new faunistic link between the African Continent and the Cape Verde Islands (*Ammidium* Erichson). *Novos Taxa Entomológicos*: 3-15.
- Koch C. 1960. The tenebrionid beetles of South West Africa. *South African Museums Association Bulletin* **7**: 73-85.
- Koch C. 1961. Die Dünentenebrioniden der Namibwüste mit besonderer Berücksichtigung ihrer Ökologie (und Physiologie). *Proceedings: XI International Congress of Entomology*. Vienna: 655-657.
- Koch C. 1962. The Tenebrionidae of Southern Africa. 31: Comprehensive notes on the tenebrionid fauna of the Namib Desert. *Annals of the Transvaal Museum, Pretoria* **24**: 61-106.
- Koch C. 1962. The Tenebrionidae of southern Africa. 32: New psammophilous species from the Namib Desert. *Annals of the Transvaal Museum, Pretoria* **24**: 107-159.
- Koch C. 1963. The Tenebrionidae of Southern Africa 29: *Luebbertia plana* gen. et spec.nov., with a dichotomic analysis of Stizopina (Opatrini). *Scientific Papers of the Namib Desert Research Station*: 1-87.
- Koch C. 1969. The Tenebrionidae of Southern Africa (Col.) part LIII: *Cardiosis hamiltonuli* a new ultra-psammophilous species from the dunes in the Namib Desert. *Scientific Papers of the Namib Desert Research Station*: 129-138.
- Lawrence R. 1965. Sun-spiders. *Animals* **6**: 232-235.
- Lawrence RF. 1962. Solifuges, scorpions and Chilopoda of the Namib Desert. *Scientific Papers of the Namib Desert Research Station*: 213-222.
- Lawrence RF. 1962. Spiders of the Namib Desert. *Annals of the Transvaal Museum, Pretoria* **24**: 197-211.
- Lawrence RF. 1963. The Solifugae of South West Africa. *Cimbebasia*: 1-28.
- Lawrence RF. 1965. Dune spiders of the Namib Desert. *Animals*: 260-263.
- Lawrence RF. 1965. New and little known Arachnida from the Namib Desert, South West Africa. *Scientific Papers of the Namib Desert Research Station*: 1-12.
- Lawrence RF. 1966. New and little known scorpions and solifuges from the Namib Desert and South West Africa. *Scientific Papers of the Namib Desert Research Station*: 1-11.
- Lawrence RF. 1966. New dune spiders (Sparassidae) from the Namib Desert, South West Africa. *Cimbebasia* **17**: 3-15.
- Lawrence RF. 1967. Additions to the fauna of South West Africa: solifuges, scorpions and pedipalpi. *Scientific Papers of the Namib Desert Research Station*: 1-19.

- Lawrence RF. 1969. A new genus of psammophile scorpion and new species of *Opisthophthalmus* from the Namib Desert. *Scientific Papers of the Namib Desert Research Station*: 105-116.
- Lawrence RF. 1972. New psammophilous Solifugae, chiefly from desert regions of the Kalahari and South West Africa. *Madoqua Series II* **1**: 97-116.
- Lawrence RF. 1975. The Chilopoda of South West Africa. *Cimbebasia Series A* **4**: 35-45.
- Le Roux GJ. 1970. *The microbiology of sand-dune ecosystems in the Namib Desert*. MSc. University of Stellenbosch, Stellenbosch: 97 pp.
- Loots, S. 2005. A Red Data Book of Namibian plants. *SABONET Report No. 38*. 124 pp.
- Mannheimer C, Jacobson K. 1998. Fungal diversity in Namibia. In: *Biological Diversity in Namibia - a country study*, Barnard P (Editor) Namibian National Biodiversity Task Force, Windhoek: 110-113.
- Mansell MW. 1990. The Myrmeleontidae of southern Africa: tribe Palparini. introduction and description of *Pamares* gen. nov., with four new species (Insecta: Neuroptera). *Journal of the Entomological Society of southern Africa* **53**: 165-189.
- Meester J. 1964. Revision of the Chrysochloridae I. the desert golden mole *Eremitalpa* Roberts. *Scientific Papers of the Namib Desert Research Station*: 1-8.
- Newlands G. 1972. A description of *Hadogenes lawrencei* sp. nov. (Scorpiones) with a checklist and key to the South West African species of the genus *Hadogenes*. *Madoqua Series II* **1**: 133-140.
- Newlands G. 1972. Notes on psammophilous scorpions and a description of a new species (Arachnida: Scorpionides). *Annals of the Transvaal Museum, Pretoria* **27**: 242-254.
- Norgaard T, Henschel JR, Jäger P. 2008. Nomenclatural mating: *Leuchorchestris kochi* Lawrence 1965 is a synonym of *Leuchorchestris arenicola* Lawrence 1962 (Arachnida, Araneae, Sparassidae). *Senckenbergiana Biologica* **88**: 41-44.
- Piffel E. 1965. *Microcaeculus namibensis* nov. spec. Ein Vertreter der Caeculiden (Arachnoidea, Acarina) aus der Namibwüste Südwestafrikas. *Scientific Papers of the Namib Desert Research Station*: 1-12.
- Prendini L. 2001. A review of synonyms and subspecies in the genus *Opisthophthalmus* C.L. Koch (Scorpiones: Scorpionidae). *African Entomology* **9**: 17-48.
- Prillinger RJ. 2007. Analysis of the biodiversity of Coleoptera (beetles) in 3 different ecosystems in Gobabeb, Namibia, for the year 2006 using the ongoing pitfall traps, in Kuiseb River - Interdunes - Quartz Hill. Gobabeb Training and Research Centre, Gobabeb: 2-13.
- Prinsloo GL. 1984. A new species of *Hockeria* Walker (Hymenoptera: Chalcididae), parasitic in two gall-inducing Lepidoptera from the Namib Desert, South West Africa. *Journal of the Entomological Society of Southern Africa* **47**: 239-244.
- Prinsloo GL. 1985. Some chalcidoid parasitoids (Hymenoptera) from the central Namib Desert. *Cimbebasia Series A* **7**: 87-105.
- Prinsloo GL. 1990. Commentary on the insect fauna of the lower Kuiseb River, Namib Desert. In: *Namib ecology 25 years of Namib research*. Seely MK (Editor) Transvaal Museum, Pretoria: 67-75.
- Schlitter DA. 1973. A new species of gerbil from South West Africa with remarks on *Gerbillus tytonis* Bauer and Niethammer, 1959 (Rodentia: Gerbillinae). *Bulletin of the Southern California Academy of Sciences* **72**: 13-18.
- Schlitter DA, Rautenbach IL, Coetzee CG. 1984. Karyotypes of southern African gerbils, genus *Gerbillus* Shortridge, 1942 (Rodentia: Cricetidae). *Annals of Carnegie Museum* **53**: 549-557.
- Scholtz CH, Harrison JDG, Grebennikov VV. (2004). Dung beetle (*Scarabaeus (Pachysoma)*) biology and immature stages: reversal to ancestral states under desert conditions (Coleoptera: Scarabaeidae). *Biological Journal of the Linnean Society*, **83**: 453-460.
- Seely MK, Griffin M. 1986. Animals of the Namib Desert: interactions with their physical environment. *Revue de Zoologie Africaine* **100**: 47-63.
- Shelley RM, Crawford CS. 1996. *Cnemodesmus riparius*, n. sp., riparian millipede from the Namib Desert, Africa (Polydesmida: Paradoxosomatidae). *Myriapodologica* **4**: 1-8.
- Siegfried WR. 1993. A 'north-south' discussion of biodiversity at Gobabeb. *South African Journal of Science* **89**: 414-415.
- Simmons LW, Ridsdill-Smith TJ. 2011. *Ecology and Evolution of Dung Beetles*. John Wiley, Chichester.
- Smith D, van Rijn S, Henschel J, Bilde T, Lubin Y. 2009. Amplified fragment length polymorphism fingerprints support limited gene flow among social spider populations. *Biological Journal of the Linnean Society* **97**: 235-246.

- Sole CL, Scholtz CH, Bastos ADS. 2005. Phylogeography of the Namib Desert dung beetles *Scarabaeus (Pachysoma) MacLeay* (Coleoptera: Scarabaeidae). *Journal of Biogeography*, **32**: 75–84.
- Steckel J. 2007. A phylogenetic approach to darkling beetles in the Namib Desert based on molecular genetics. Diploma, University of Marburg, Marburg, Germany: 61 pp.
- Steckel J, Penrith ML, Henschel J, Brandl R, Meyer J. 2010. A preliminary molecular phylogeny of the Namib Desert darkling beetles (Tenebrionidae). *African Zoology* **45**: 107-114.
- Stuart CT. 1980. An annotated preliminary list of amphibians and reptiles known to occur in the Namib Desert Park, Namibia. *Journal of the Herpetological Association of Africa* **24**: 4-13.
- Suhling F, Martens A. 2007. Dragonflies and Damselflies of Namibia. Gamsberg Macmillan, Windhoek: 277 pp.
- Thompson RT. 1988. Revision of the weevil genus *Leptostethus* Waterhouse, 1853 (Coleoptera: Curculionidae: Entiminae). *Cimbebasia Memoir*: 80 pp.
- Werner YL. 1977. Ecological comments on some gekkonid lizards of the Namib Desert, South West Africa. *Madoqua* **10**: 157-169.
- Wharton RA. 1981. Namibian Solifugae (Arachnida). *Cimbebasia Memoir*: 1-87.
- Wharton RA, Seely MK. 1982. Species composition of and biological notes on Tenebrionidae of the lower Kuiseb River and adjacent gravel plain. *Madoqua* **13**: 5-25.

Climate and weather

- Beery A. 1999. *Atmospheric circulations relating to the formation of fog in the Central Namib Desert, Namibia*. MSc. Oxford University, Oxford: 70 pp.
- Cermak J. 2011. Low clouds and fog along the South-Western African coast – Satellite-based retrieval and spatial patterns. *Atmospheric Research*. Doi:10.1016/j.atmosres. 2011.02.012.
- Eckardt FD. 1998. The chemistry of Namib Desert fog in comparison with coastal desert fog of Chile and Oman. In: *Proceedings: 1st Conference on Fog and Fog Collection*. International Development Research Centre. Vancouver, Canada: 187-189.
- Eckardt FD, Schemenauer RS. 1998. Fog water chemistry in the Namib Desert, Namibia. *Atmospheric Environment* **32**: 2595-2599.
- Gamble FM. 1980. Rainfall in the Namib Desert Park. *Madoqua* **12**: 175-180.
- Gray V. 1980. Fog precipitation in the Central Namib Desert: a short-term project. *Namib Bulletin, Gobabeb*: 6-8.
- Haensler A, Hagemann S, Jacob D. 2011. The role of the simulation setup in a long-term high-resolution climate change projection for the southern African region. *Theor Appl Climatol* **106**: 153-169.
- Haensler A, Hagemann S, Jacob D. 2011. Dynamical downscaling of ERA40 reanalysis data over southern Africa: added value in the simulation of the seasonal rainfall characteristics. *Int. J. Climatol* **31**: 2338-2349.
- Henschel J. 1997. Fog harvesting. *Namib Bulletin, Windhoek* 14: 9.
- Henschel J, Mtuleni V, Gruntkowski N, Seely M, Shanyengana SE. 1998. NAMFOG: Namibian application of fog-collecting systems phase I: evaluation of fog water harvesting. (*Occasional paper no. 8*) Desert Research Foundation of Namibia (DRFN), Windhoek & Gobabeb Training and Research Centre: 82 pp.
- Henschel J, Mtuleni V, Gruntkowski N, Seely MK, Shanyengana E. 1999. Namibian application of fog-collecting systems. In: *Advances in planning and management of watersheds and wetlands in Eastern and Southern Africa*. FitzGibbon JE, Devlin J. (Editors) Weaver Press, Harare, Zimbabwe & Guelph, Canada: 91-110 pp.
- Henschel JR, Seely MK. 2000. Developing fog harvesting in Namibia. Conference paper: Biennial congress of the African division of the International Association of Hydraulic Research. Windhoek.
- Kaseba S. 2000. Water use of standard fog collectors (SFC's). Diploma. Gobabeb Training and Research Centre (In-house training report) and Polytechnic of Namibia. Windhoek: 2-17.
- Kaseke KF. 2009. "Non rainfall" atmospheric water in arid soil micro-hydrology and ecology. MSc. University of Stellenbosch, Stellenbosch: 184 pp.
- Kimura K. 2005. Origin of the fog in Namib Desert in dry season. *African Study Monographs Suppl.* **30**: 57-64.
- Lancaster J. 1980. Climatological research in the Namib Desert. *Namib Bulletin, Gobabeb*: 9-10.

- Lancaster J, Lancaster N, Seely MK. 1984. Climate of the central Namib Desert. *Madoqua* **14**: 5-61.
- Lengoasa JR, Lindesay JA, van Nierop AM. 1993. The influence of a synoptic-scale disturbance on topographically induced boundary layer circulations over the central Namib Desert. *Madoqua* **18**: 71-78.
- Lindesay JA, Tyson PD. 1990. Climate and near-surface airflow over the central Namib. In: *Namib ecology 25 years of Namib research*. Seely M (Editor) Transvaal Museum, Pretoria: 27-37.
- Makuti O, Henschel JR, Kolb H, Mtuleni V, Siteketa V, Shanyengana ES. 2004. Testing fog collectors in the Namib Desert. *Proceedings: The third international conference on fog, fog collection and dew*. Fog and Fog Collection. Rautenbach H. (Editor) Cape Town: 1-4.
- Mtuleni V, Henschel JR, Seely MK. 1998. Evaluation of fog-harvesting potential in Namibia. *Proceedings: 1st Conference on Fog and Fog Collection*. International Development Research Centre (IDRC) Schemenauer RS, Bridgman H (Eds) Vancouver, Canada: 179-182.
- Muller A, Reason CJC, Fauchereau N. 2008. Extreme rainfall in the Namib Desert during late summer 2006 and influences of regional ocean variability. *International Journal of Climatology* **28**: 1061-1070.
- Nieman WA, Heyns C, Seely MK. 1978. A note on precipitation at Swakopmund. *Madoqua* **11**: 69-73.
- Olivier, J. 1995. Spatial distribution of fog in the Namib. *Journal of Arid Environments* **29**(2): 128-138.
- Pieterse JE. 2009. Investigation of the atmospheric boundary layer in the Namib Desert interdune. Diploma. Department of Mechanical and Mechatronic Engineering, Stellenbosch University, Stellenbosch: 64 pp.
- Pietruszka RD, Seely MK. 1985. Predictability of two moisture sources in the Namib Desert. *South African Journal of Science* **81**: 682-685.
- Schulze BR. 1969. The climate of Gobabeb. *Scientific Papers of the Namib Desert Research Station*: 5-12.
- Sederholm E. 2001. Is it possible to get water to a desert from fog. *Kouvolan Sanomat* (21 April 2001), Jyväskylä, Finland: page 14.
- Seely MK, Henschel JR. 1998. The climatology of Namib fog. *Proceedings: 1st Conference on Fog and Fog Collection*. International Development Research Centre (IDRC) Schemenauer RS, Bridgman H (Editors) Vancouver, Canada: 353-356.
- Seely M, Henschel J. 2000. Developing fog harvesting in Namibia. *Newsletter of the Namibia Scientific Society*, Windhoek: 30-42.
- Seely MK, Stuart P. 1976. Namib climate: 2. The climate of Gobabeb, ten-year summary 1962/72. *Namib Bulletin*, Gobabeb: 7-9.
- Shanyengana ES, Henschel JR, Mtuleni VS, Mwenya E, Seely MK. 2001. Exploring fog as a supplementary water source in Namibia. In: *2nd International Conference on Fog and Fog Collection*, St. John's, Canada: 273-276.
- Shanyengana ES, Henschel JR, Seely MK, Sanderson RD. 2002. Exploring fog as a supplementary water source in Namibia. *Atmospheric Research* **64**: 251-259.
- Shanyengana ES, Sanderson RD, Seely MK, Schemenauer RS. 2003. Testing greenhouse shade nets in collection of fog for water supply. *Journal of Water Supply: Research and Technology - AQUA* **52**: 237-241.
- Sharon D. 1981. The distribution in space of local rainfall in the Namib Desert. *Journal of Climatology* **1**: 69-75.
- Soderberg KS. 2010. *The role of fog in the ecohydrology and biogeochemistry of the Namib Desert*. PhD. Department of Environmental Sciences, University of Virginia: 200 pp.
- Taljaard JJ. 1979. Low-level atmospheric circulation over the Namib. *Newsletter (South Africa. Weather Bureau)*, Weather Bureau Department of Transport, Pretoria: 65-67.
- Tyson PD, Seely MK. 1980. Local winds over the central Namib. *South African Geographical Journal* **62**: 135-150.
- Vendrig M. 1990. Fog occurrence and measurement in Namibia. Unpubl. Honours Research Project, Department of Geography and Environmental Studies, University of the Witwatersrand, Johannesburg: 32 pp.

Ecology

- Dawson WR, Pinshow B, Bartholomew GA, Seely MK, Shkolnik A, Shoemaker VH, Teeri JA. 1989. What's special about the physiological ecology of desert organisms? *Journal of Arid Environments* **17**: 131-143.
- Dirkx E, Hager C, Tadross M, Bethune S, Curtis B. 2008. Climate change vulnerability & adaptation assessment Namibia, Desert Research Foundation of Namibia & Climate Systems Analysis Group for the Ministry of Environment and Tourism, Windhoek: 1-167.
- Eichler H. 1990. Von Wasser und Wind in der zentralen Namib (Namibia) - Bemerkungen zum wenig beachteten Feuchtehaushalt in den Dünenstränden einer Nebelwüste. *Mainzer Geographische Studien* **34**: 61-76.
- Getzin S. 2005. The suitability of the degradation gradient method in arid Namibia. *African Journal of Ecology* **43**: 340-351.
- Günster A, Hadley NF, Mitchell D, Nobel PS, Seely M. 1994. Form and function. In: *Deserts*. Seely M (Editor) Weldon Owen Production, McMahons Point, NSW, Australia: 66-79.
- Hamilton WJ III. 1973. Life's color code. McGraw-Hill Book Company, New York: 238 pp.
- Henschel J. 1996. Subsidiarisation empoverishes local resources and increases dependency of local consumers: a lesson from spiders and aquatic insects. *Namib Bulletin*, Windhoek **13**: 13.
- Henschel JR, Robertson MB, Seely MK. 2001. Animal ecophysiology in the Namib Desert: coping with little water, scarce food and elevated temperatures. In: *Ecology of desert environments*. Prakash I (Editor) Scientific Publishers, Jodhpur, India: 423-457 pp.
- Henschel JR, Seely MK. 2004. First approximation of the ecophysiology of fog and dew - a tribute to Gideon Louw. Proceedings: The third international conference on fog, fog collection and dew. "Fog and Fog Collection" Rautenbach H (Editor) Cape Town: 1-4.
- Henschel JR, Seely MK. 2008. Ecophysiology of atmospheric moisture in the Namib Desert. *Atmospheric Research* **87**: 362-368.
- Jacobson KM, Jacobson PJ. 1998. Rainfall regulates decomposition of buried cellulose in the Namib Desert. *Journal of Arid Environments* **38**: 571-583.
- Joubert EC. 2010. *A computational fluid dynamics study of the near surface wind patterns over a desert dune and the effect on seed dispersion*. MSc, Department of Mechanical and Mechatronic Engineering, University of Stellenbosch, Stellenbosch: 1-120.
- Jürgens N, Burke A, Seely MK, Jacobson KM. 1997. Desert. In: *Vegetation of Southern Africa*, Cowling RM, Richardson DM, Pierce SM (Editors) Cambridge University Press, Cambridge: 189-214.
- Katoma L-N. 1989. A comparative analysis of the sand-trapping potential of two Namib desert shrubs: a case-study at Gobabeb. BSc. Honours University of Fort Hare. Fort Hare: 1-84.
- Koch C. 1961. Some aspects of abundant life in the vegetationless sand of the Namib Desert dunes positive psammotropism in tenebrionid-beetles. *Journal S.W.A. Scientific Society* **15**: 9-34.
- Koch C. 1962. Zur Ökologie der Dünen-Tenebrioniden der Namibwüste Südwest-Afrikas und Angolas. *Lunds Universitets Arsskrift N.F.* **58**: 3-25.
- Kühnelt W. 1963. Die ökologischen Verhältnisse der Namib-Wüste (Südwestafrika). *Proceedings: Comunicacion al Coloquio "Aportacion de las Investigaciones Ecologicas y Agricolas a la lucha del mundo contra el hambre"*. Madrid, Spain: 1-20.
- Kühnelt W. 1965. Nahrungsbeziehungen innerhalb der Tierwelt der Namibwüste (Südwestafrika). *Österreichische Akademie der Wissenschaften I* **174**(5/6): 185-190.
- Lawrence RF. 1959. The sand-dune fauna of the Namib Desert. *South African Journal of Science* **55**: 233-239.
- Linsenmair KE, Henschel J. 2007. Arthropods as ecosystem engineers: the impact of ants, termites and tenebrionid beetles on soil properties and vegetation. In: *Biodiversity Monitoring Transect Analysis in Africa. Towards sustainable use of biodiversity*. Bundesministerium für Bildung und Forschung, Hamburg: 143-151.
- Lombard AT. 1989. *The thermal implications and ecological consequences of coloration in selected species: Tenebrionid beetles (Onymacris bicolour and Onymacris unguicularis), Cape gannets (Morus capensis) and Cape comorants (Phalacrocorax capensis)*. PhD. University of Cape Town, Cape Town: 205 pp.

- Louw GN. 1971. Water economy of certain Namib Desert animals. *South African Journal of Science* **67**: 119-123.
- Louw GN. 1972. The role of advective fog in the water economy of certain Namib Desert animals. Proceedings: *Comparative physiology of desert animals*. Maloiy GMO (Editor) Symposium of the Zoological Society, London: 297-314.
- Louw GN. 1983. Water & desert survival. *Rössing Magazine*, Windhoek: 16-20.
- Louw GN. 1990. Physiological studies on the Namib fauna: a brief critique. In: *Namib ecology 25 years of Namib research*. Seely MK (Editor) Transvaal Museum, Pretoria: 203-207.
- Mitchell D, Laburn HP, Matter M, McClain E. 1990. Fever in Namib and other ectotherms. In: *Namib ecology 25 years of Namib research*. Seely MK (Editor) Transvaal Museum, Pretoria: 179-192.
- Robinson MD, Seely MK. 1980. Physical and biotic environments of the southern Namib dune ecosystem. *Journal of Arid Environments* **3**: 183-203.
- Seely MK. 1978. The Namib dune desert: an unusual ecosystem. *Journal of Arid Environments* **1**: 117-128.
- Seely MK. 1978. Desert research. *South African Journal of Science* **74** (5): 196.
- Seely MK. 1979. Ecology of a living desert: twenty years of research in the Namib. *South African Journal of Science* **75**: 298-303.
- Seely MK. 1984. The Namib's place among the deserts of the world. *South African Journal of Science* **80**: 155-158.
- Seely M. 1985. Predation and environment as selective forces in the Namib Desert. In: *Species and speciation*, Vrba ES (Editor), *Transvaal Museum Monograph*, Volume 4, Pretoria: 161-165.
- Seely MK. 1986. The Namib desert. In: *Ecosystems of the World 12 B, Hot Deserts and Shrublands*. Evenari M, Noy-Meir I, Goodall DW (eds), Elsevier, Amsterdam: 245-282.
- Seely MK. 1986. An approach to the study of sand dune ecosystems. In: *Structure and function of sand dune ecosystems*. Volume 8. Van der Merwe D, McLachlan A, Hesp P (Editors), Institute for Coastal Research, Port Elizabeth: 8-15.
- Seely MK. 1986. Feedback interactions: when could these take place in the Namib dune ecosystem? In: *Structure and function of sand dune ecosystems*. Volume 8. Van der Merwe D, McLachlan A, Hesp P (Editors) Institute for Coastal Research, Port Elizabeth: 64-66.
- Seely MK. 1989. Is there anything special about the Namib Desert? *South African Journal of Science* **85**: 215.
- Seely MK. 1991. Dunes '89 introduction. *Journal of Arid Environments* **21**: 129-130.
- Seely MK. 1991. Sand dune communities. In: *The ecology of desert communities*, Polis GA (Editor) The University of Arizona Press, Tucson: 348-382.
- Seely MK. 1993. A brief review of the ecology of sandy deserts. *Boll. Acc. Gioenia Sci. Nat.* **26**: 51-69.
- Seely M. 1994. A diverse desert community. In: *Deserts*. The illustrated library of the earth. Weldon Owen Pty Limited, McMahan's Point, Australia: 48-49.
- Seely M, Henschel J, Robertson M. 1998. The ecology of fog in Namib Desert dunes. Proceedings: 1st Conference on Fog and Fog Collection. International Development Research Centre (IDRC). Schemenauer RS, Bridgman H (Editors), Vancouver, Canada: 183-186.
- Seely MK, Louw GN. 1980. First approximation of the effects of rainfall on the ecology and energetics of a Namib Desert dune ecosystem. *Journal of Arid Environments* **3**: 25-54.
- Seely MK, Louw GN. 1986. Who goes where under desert sands. *Nuclear Active*, Windhoek: 12-15.
- Seely MK, Mitchell D. 1987. Is the subsurface environment of the Namib Desert dunes a thermal haven for chthonic beetles? *South African Journal of Zoology* **22**: 57-61.
- Seely MK, Mitchell D, Louw GN. 1985. A field technique using iridium-192 for measuring subsurface depths in free-ranging Namib Desert beetles. *South African Journal of Science* **81**: 686-688.
- Seely MK, Ward JD. 1988. The Namib Desert. In: *Long-term data series relating to Southern Africa*. Macdonald IAW, Crawford RJM (Editors) South African National Scientific Programmes Report no. 157, Pretoria: 268-279.
- Shannon LV, Seely MK, Ward JD. 1988. Proceedings of the Namib-Benguela interactions workshop. Foundation for Research Development Ecosystem Programmes, FRD Ecosystem Programmes Occasional Report Series Volume 41, Gobabeb: 1-38.
- Shannon LV, Siegfried WR, Ward JD. 1989. Namib-Benguela interactions. *South African Journal of Science* **85**: 277-279.

- Southgate RI, Masters P, Seely MK. 1996. Precipitation and biomass changes in the Namib Desert dune ecosystem. *Journal of Arid Environments* **33**: 267-280.
- Tschinkel WR. 1973. The sorption of water vapor by windborne plant debris in the Namib Desert. *Madoqua Series II* 2: 21-24.
- Wall DH, Bradford MA, St. John MG, Trofymow JA, Behan-Pelletier V, Bignell DE, Dangerfield M, Parton WJ, Rusek J, Voigt W, Wolters V, Gardel HZ, Ayuke FO, Bashford R, Beljakova OI, Bohlen PJ, Brauman A, Flemming S, Henschel JR, Johnson DL, Jones TH, Kovarova M, Kranabetter JM, Kutny L, Lin K-C, Maryati M, Masse D, Pokarzhevskii A, Rahman H, Sabará MG, Salamon J-A, Swift MJ, Varela A, Vasconcelos HL, White DS, Zou X. 2008. Global decomposition experiment shows soil animal impacts on decomposition are climate-dependent. *Global Change Biology* **14**: 2661-2677.
- Walter H. 1986. The Namib Desert. In: *Ecosystems of the world 12B Hot Deserts and Arid Shrublands*. Evenary M, Noy-Meir I, Goodall DW (Editors) With contributions by: Giess W, Scholz H, Von Schwind H, Seely MK, Walter E. Elsevier, Amsterdam: 245-282.
- Ward JD, Corbett I. 1990. Towards an age for the Namib. In: *Namib ecology 25 years of Namib research*. Seely MK (Editor) Transvaal Museum, Pretoria: 17-26.
- Ward JD, Seely MK, Lancaster N. 1983. On the antiquity of the Namib. *South African Journal of Science* **79**: 175-183.

Ephemeral rivers, water and hydrology

- Amoomo H, Elago P, Gaseb N, Hoveka V, Khairabes M, Mbangula E, Muharukua V, Mukuya S, Ndjeula H, Noongo E, Shinedima R, Zaaruka B. 2000. Determining the water reserve for the Kuiseb River. Occasional paper no. 11, Desert Research Foundation of Namibia, Windhoek & Gobabeb Training and Research Centre: 1-61.
- Arnold S. 2010. *Integrated modelling of ecohydrological processes along ephemeral rivers*. Ph. D. Chemisch-Geowissenschaftlichen Fakultät. Friedrich-Schiller-Universität, Jena, Germany: 133 pp.
- Benito G, Rohde R, Seely M, Külls C, Dahan O, Enzel Y, Todd S, Botero B, Morin E, Grodek T, Roberts C. 2010. Management of alluvial aquifers in two southern African ephemeral rivers: implications for IWRM. *Water Resources Management* **24**(4): 641-667.
- Botes A, Henderson J, Nakale T, Nantanga K, Schachtschneider K, Seely M. 2003. Ephemeral rivers and their development: testing an approach to basin management committees on the Kuiseb River, Namibia. *Physics and Chemistry of the Earth* **28**: 853-867.
- Dahan O, Tatarsky B, Enzel Y, Külls C, Seely M, Benito G. 2008. Dynamics of flood water infiltration and ground water recharge in hyperarid desert. *Ground Water*: 1-12.
- Grobbelaar JU. 1976. Some limnological properties of an ephemeral waterbody at Sossus Vlei, Namib Desert, South West Africa. *Journal of the Limnological Society of southern Africa* **2**: 51-54.
- Grobbelaar JU, Seely MK. 1980. The composition of water collected from the Kuiseb River, Namib Desert, at Gobabeb. *Journal of the Limnological Society of Southern Africa* **6**(1): 46-48.
- Heidbüchel I. 2007. *Recharge processes in ephemeral streams derived from a coupled stream flow routing / groundwater model - application to the Lower Kuiseb (Namibia)*. Diploma. Albert-Ludwigs-Universität, Freiburg i. Br.: 1-88.
- Hewett SS. 1996. *High magnitude flood deposits of the Kuiseb: an analysis of driftwood deposition on an ephemeral river*. BA. Honours Jesus College, Oxford: 55 pp.
- Huntley BJ. 1985. (Editor) *The Kuiseb environment: the development of a monitoring baseline*. Council for Scientific and Industrial Research, South African National Scientific Programmes, Pretoria: 138 pp.
- lipinge JN. 2004. *Productivity of detritus in the different ecosystems and factors affecting decomposition rate in the Kuiseb River*. Diploma. Gobabeb Training and Research Centre (In-house training report) and Polytechnic of Namibia, Windhoek: 2-18.
- Jacobson P. 1994. The ephemeral rivers of the Namib. *Namib Bulletin*, Windhoek: 7-9.
- Jacobson PJ. 1997. *An ephemeral perspective of fluvial ecosystems: viewing ephemeral rivers in the context of current lotic ecology*. PhD. Virginia Polytechnic Institute and State University, Blacksburg, Virginia: 132 pp.

- Jacobson PJ, Jacobson KM, Angermeier PL, Cherry DS. 1999. Transport, retention, and ecological significance of woody debris within a large ephemeral river. *Journal of the North American Benthological Society* **18**: 429-444.
- Jacobson PJ, Jacobson KM, Angermeier PL, Cherry DS. 2000. Hydrologic influences on soil properties along ephemeral rivers in the Namib Desert. *Journal of Arid Environments* **45**: 21-34.
- Jacobson PJ, Jacobson KM, Angermeier PL, Cherry DS. 2000. Variation in material transport and water chemistry along a large ephemeral river in the Namib Desert. *Freshwater Biology* **44**: 481-491.
- Jacobson PJ, Jacobson KM, Seely MK. 1995. *Ephemeral rivers and their catchments. Sustaining people and development in western Namibia*. Desert Research Foundation of Namibia, Windhoek: 160 pp.
- Kaaronda DU. 2005. *The spatial distribution of tree species across the Kuiseb river channel in relation to watercourse*. Diploma. Gobabeb Training and Research Centre (In-house training report) and Polytechnic of Namibia, Windhoek: 1-18.
- Kasoana M. 2004. Tree distribution, vegetative and regenerative growth of seedlings at two selected sites in the Kuiseb River. *Roan News*, Windhoek: 18-25.
- Koch C. 1963. An illustrated account of a major flood in the Kuiseb River. *Der Kreis* **6**: 39-51.
- Kok OB, Grobbelaar JU. 1980. Chemical properties of water-holes in the Kuiseb River Canyon, Namib Desert. *Journal of the Limnological Society of Southern Africa* **6**: 82-84.
- Kok OB, Nel JAJ. 1996. The Kuiseb river as a linear oasis in the Namib desert. *African Journal of Ecology* **34**: 39-47.
- Lange J. 2005. Dynamics of transmission losses in a large arid stream channel. *Journal of Hydrology* **306**: 112-126.
- Mizuno K. 2005. Environmental changes in relation to tree death along the Kuiseb River in the Namib Desert. *African Study Monographs Suppl.* **30**: 27-41.
- Mizuno K. 2010. Environmental change and vegetation succession along an ephemeral river: the Kuiseb in the Namib Desert. *African Study Monographs Supplement*: 3-18.
- Mizuno K, Yamagata K. 2005. Vegetation succession and plant use in relation to environmental changes along the Kuiseb River in the Namib Desert. *African Study Monographs Suppl.* **30**: 3-14.
- Morin E, Grodek T, Dahan O, Benito G, Kulls C, Jacoby Y, van Langenhove G, Seely M, Enzel Y. 2009. Flood routing and alluvial aquifer recharge along the ephemeral arid Kuiseb River, Namibia. *Journal of Hydrology* **368**: 262-275.
- Mouat D, Bassett S, Lancaster J. 2002. Water source and linear oasis: assessing alternative futures for the Kuiseb River basin, Namibia. *Proceedings: Alternative ways to combat desertification: connecting community action with science and common sense*. Ward V (Editor) Cape Town, Gobabeb: 34.
- Nghishidi JJ. 2005. *The relationship between fallen coppicing tree species and floods in the Kuiseb River-flood plain in the Namib Naukluft Park, Namib Desert*. Gobabeb Training and Research Centre (In-house training report) and Polytechnic of Namibia, Natural Resource Management, Windhoek: 14 pp.
- Phemelo M. 2005. *The distribution of height and trunk diameter of different tree species in relation to the main river channel as a potential indicator for age of trees in the Kuiseb River*. Gobabeb Training and Research Centre (In-house training report) and Polytechnic of Namibia, Windhoek: 8 pp.
- Schachtschneider K. 2010. *Water sourcing by riparian tree species in ephemeral rivers*. PhD. Department of Botany, University of Cape Town, Cape Town: 130 pp
- Schachtschneider K, February E. 2004. Water sourcing by riparian tree species in ephemeral rivers. *Proceedings: 5th Waternet / Warfsa*. Global Water Partnership, Windhoek: 158.
- Schachtschneider K, February EC. 2010. The relationship between fog, floods, groundwater and tree growth along the lower Kuiseb River in the hyperarid Namib. *Journal of Arid Environments* **74**: 1632-1637.
- Schmitz AU. 2004. *Transmission losses and soil moisture dynamics in the alluvial fill of the Kuiseb river, Namibia*. Diploma. Albert-Ludwigs-Universität Freiburg i. Br.: 75 pp.
- Seely MK. 2005. Kuiseb River. In: *Environmental water requirements in non-perennial systems*. Water Research Commission, Gezina: 206-225.
- Seely MK, Henderson J, Heyns P, Jacobson P, Nakale T, Nantanga K, Schachtschneider K. 2003. Ephemeral and endoreic river systems: Relevance and management challenges. Pp 187-212. In: Turton A,

- Ashton P, Cloete E (eds). *Transboundary rivers, sovereignty and development*. African Water Issues Research Unit (AWIRU) and Green Cross International (GCI): 369 pp.
- Shanyengana ES. 2002. *Groundwater chemistry and supplementary sources of freshwater in arid environments: groundwater salinisation, solar desalination & fog collection*. PhD. Chemistry Department, University of Stellenbosch, Stellenbosch: 186 pp.
- Shanyengana ES, Seely MK, Sanderson RD. 2004. Major-ion chemistry and ground-water salinization in ephemeral floodplains in some arid regions of Namibia. *Journal of Arid Environments* **57**: 211-223.
- Stengel HW. 1964. *Das Abkommen des Kuseb und Swakop für die Zeit von 1898 - 1938*. Water Affairs Branch, S.W.A. Administration, Ministry of Water Affairs, Windhoek: 14 pp.
- Stengel HW. 1964. *The source of drinking water at Gobabeb*. Water Affairs Branch, S.W.A. Administration, Ministry of Water Affairs, Windhoek: 17 pp.
- Tatarsky B. 2007. *Dynamics of floodwater infiltration and groundwater recharge along ephemeral channels in arid regions, Southwest Africa*. MSc.Thesis. Ben-Gurion University of the Negev, Be'ér Sheva', Israel: 119 pp.
- Yamagata K. 2010. Recent grain-size coarsening of floodplain deposits and forest decline along the Kuseb River, Namib Desert, Namibia. *African Study Monographs Supplement*: 19-30.
- Yamagata K, Mizuno K. 2005. Landform development along the middle course of the Kuseb River in the Namib Desert, Namibia. *African Study Monographs Suppl.* **30**: 15-25.

General

- Anonymous. 2007. Namib places . . . features and facets that make the Namib unique. *Sandpaper*, Windhoek: 4-7.
- Brain CK. 1984. Comments on the Namib's past. *South African Journal of Science* **80**: 158-159.
- Brain CK. 1990. Twenty-five years of Namib Desert research: a personal perspective. In: *Namib ecology 25 years of Namib research*. Seely MK (Editor) Transvaal Museum, Pretoria: 5-12.
- Dingle RV, Siesser WG, Newton AR. 1983. *Mesozoic and Tertiary Geology of Southern Africa*. AA Balkema, Rotterdam: 375 pp.
- Grunewald O, Gilbertas B. 2003. *Namibie. Le désert de la vie*. Publisher: Nathan, Paris: 190 pp.
- Logan RF. 1960. *The Central Namib Desert South West Africa* Publication 758. National Academy of Sciences - National Research Council, Washington, D.C: 162 pp.
- Louw G, Seely M. 1982. *Ecology of desert organisms*. Longman Group Limited, London and New York: 194 pp.
- Lovegrove B. 1993. *The living deserts of southern Africa*. Fernwood Press, Cape Town: 224 pp.
- McClain L, Brain G. 2001. *Leonard the landrover*. (1st Edition, reprinted) Gamsberg Macmillan Publishers (Pty) Ltd, Windhoek: 39 pp.
- Mendelsohn, J. Jarvis, A. Roberts, C. and Robertson, T. 2002. Atlas of Namibia. David Philip, Cape Town: 200 pp.
- MET. Undated. *State of the Marine Environment in Namibia*. Ministry of Environment & Tourism, Directorate of Environmental Affairs, Windhoek.
- MET. 1999. *State of the Environment Report on Namibia's Industrialisation Environment. Volume 1: Indicators. Final Report*. Ministry of Environment & Tourism, Directorate of Environmental Affairs, Windhoek.
- MET. 1999. *State of the Environment Report on Namibia's Industrialisation Environment. Volume 2: State of the Environment. Final Report*. Ministry of Environment & Tourism, Directorate of Environmental Affairs, Windhoek.
- MET. 1999. *State of the Environment Report on the socio-economic Environment in Namibia*. Ministry of Environment & Tourism, Directorate of Environmental Affairs, Windhoek.
- MET. 1999. *State of the Environment Report on Water in Namibia. Volume 1: Executive Summary*. Ministry of Environment & Tourism, Directorate of Environmental Affairs, Windhoek.
- MET. 2000. *State of the Environment Report on Agriculture and Land Resources. Final Report*. Ministry of Environment & Tourism, Directorate of Environmental Affairs, Windhoek.
- MET. 2000. *State of Environment Report on Parks, Tourism and Biodiversity*. Report no. W423. Ministry of Environment & Tourism, Directorate of Environmental Affairs, Windhoek.

- MET. 2000. *State of the Environment Report on Waste and Pollution – Waste or Resource?* Ministry of Environment & Tourism, Directorate of Environmental Affairs, Windhoek.
- MET. 2001. *State of the Environment Report on Waste in Namibia*. Ministry of Environment & Tourism, Directorate of Environmental Affairs, Windhoek.
- MET. 2006. *Vital Signs of Namibia 2004 – An Integrated State of the Environment Report*. Ministry of Environment & Tourism, Directorate of Environmental Affairs, Windhoek.
- MET. 2010. *Climate Change Vulnerability and Adaptation Assessment for Namibia's Biodiversity and Protected Area System*. Ministry of Environment & Tourism, Directorate of Parks & Wildlife Management, Windhoek.
- MET. 2010. *The Economic Value of Namibia's Protected Area System: A Case for Increased Investment*. Ministry of Environment & Tourism, Directorate of Parks & Wildlife Management, Windhoek.
- MET. 2010. *State of Protected Areas in Namibia – A Review of progress and challenges*. Ministry of Environment & Tourism, Directorate of Parks & Wildlife Management, Windhoek: 177 pp.
- MET. 2010. *Sustainable Financing Plan for Namibia's Protected Area System*. Ministry of Environment & Tourism, Directorate of Parks & Wildlife Management, Windhoek.
- NACOMA. 2009. *Strategic Environmental Assessment (SEA) for the Coastal areas of the Karas and Hardap Regions – Final Report*. Ministry of Environment & Tourism: 84 pp.
- NACOMA. 2009. *Strategic Environmental Assessment (SEA) for the Coastal areas of the Erongo and Kunene Regions – Final Report*. Ministry of Environment & Tourism: 111 pp
- NACOMA. 2010. *Strategic Environmental Assessment (SEA) for the Coastal areas of Namibia – Combined Report*. Ministry of Environment & Tourism.
- Pallett J. 1995. (Editor) *The Sperrgebiet – Namibia's least known wilderness*. Desert Research Foundation of Namibia and NAMDEB Diamond Corporation (Pty) Ltd, Windhoek: 84 pp.
- Polis GA. 1991. (Editor) *The ecology of desert communities*. Desert ecology series, University of Arizona Press, Tucson: 456 pp.
- Seely MK. 1987. *The Namib - Natural history of an ancient desert*. DRFN, Namibia: 104 pp. (English edition 1987, 1992, 2004, 2010; German edition 1988, 2008.)
- Seely MK. 1990. (Editor) *Namib ecology*. Monograph 7. Transvaal Museum, Pretoria: 230 pp.
- Seely M. (Editor) 1994. *Deserts. The illustrated library of the earth*. Weldon Owen Pty Limited, McMahons Point, Australia: 160 pp.
- Seely M, Pallett J. 2008. *Namib - Secrets of a desert uncovered*. Venture Publications, Windhoek: 202 pp.
- Seely MK, Ward JD, Marais C. 1989. *Dunes '89 Excursion 2. A Field Guide: Ecological aspects of dunes in the central Namib Desert*: 92 pp.
- Skinner JD, Chimimba CT. 2005. *The Mammals of the Southern African Subregion*. Third Edition. Cambridge University Press.
- Wallace, M. 2011. *The history of Namibia*. Jacana, Pretoria.
- Ward JD, Seely MK, Marais C. 1989. *Dunes'89 Excursion 1A Field Guide : Geomorphological aspects of dunes in the central Namib Desert*: 95 pp.

Geomorphology

- Bao H, Thiemens MH, Heine K. 2001. Oxygen-17 excesses of the central Namib gypcretes: spatial distribution. *Earth and Planetary Science Letters* **192**: 125-135.
- Barnard WS. 1973. Duinformasies in die sentrale Namib. *Tegnikon* 22: 2-13.
- Barnes J. 1999. *Barchan dune morphology, migration and management on the Kuseb River delta, Namibia*. MSc. St. Catherine's College Department of Geography, Oxford: 89 pp.
- Barnes J. 2001. Barchan dunes on the Kuseb River delta, Namibia. *South African Journal of Geography* **83**: 283-292.
- Bell L. 2009. *An investigation into the controls and dynamics of superimposed dunes on complex linear dunes in the Namib Sand Sea*. BA Diploma. Geography Department, Oxford University, Oxford: 77 pp.
- Besler H. 1970. Geomorphologie der Wüste. *Namib und Meer* **1**: 59-68.
- Besler H. 1972. Geomorphologie der Dünen. *Namib und Meer* **3**: 25-35.

- Besler H. 1972. *Klimaverhältnisse und klimageomorphologische Zonierung der zentralen Namib (Südwestafrika)*. *Stuttgarter Geographische Studien Volume 83*. Geographisches Institut der Universität Stuttgart: 209 pp.
- Besler H. 1975. Der Namib-Erg und die Südafrikanische Randstufe. In: *Die Erde neu entdeckt*. Beckel L, Schneider S (Editors) Mainz: 55.
- Besler H. 1975. Messungen zur Mobilität von Dünensanden am Nordrand der Dünen-Namib (Südwestafrika). *Proceedings: Dynamische Geomorphologie. 1. Symposium des Deutschen Arbeitskreises für Geomorphologie*, Würzburg: 135-147.
- Besler H. 1976. Wasserüberformte Dünen als Glied in der Landschaftsgenese der Namib. *Geomethodica* **15**: 83-106.
- Besler H. 1977. Untersuchungen in der Dünen-Namib (Südwestafrika): vorläufige Ergebnisse des Forschungsaufenthaltes 1976. *Journal South West African Scientific Society* **31**: 33-64.
- Besler H. 1979. Salinitätsmessungen an Sanden als Hilfsmittel zur Rekonstruktion fossiler Gewässernetze in ariden Räumen. *Zeitschrift für Geomorphologie N.F.* **23**: 192-198.
- Besler H. 1980. *Die Dünen-Namib: Entstehung und Dynamik eines Ergs*. *Stuttgarter Geographische Studien Volume 96*. Geographisches Institut der Universität Stuttgart: 208 pp.
- Besler H. 1981. Surface structures on Namib dunes caused by moisture. *Namib und Meer* **9**: 11-17.
- Besler H. 1983. The response diagram: distinction between aeolian mobility and stability of sands and aeolian residuals by grain size parameters. *Zeitschrift für Geomorphologie* **45**: 287-301.
- Besler H. 1984. The development of the Namib dune field according to sedimentological and geomorphological evidence. In: *Late Cainozoic Palaeoclimates of the Southern Hemisphere*. Vogel JC (Editor) AA Balkema, Rotterdam: 445-453.
- Besler H. 1991. Der Namib Erg: Älteste Wüste oder älteste Dünen? *Geomethodica* **16**: 93-122.
- Besler H. 1996. The Tsondab Sandstone in Namibia and its significance for the Namib Erg. *South African Journal of Geology* **99**: 77-87.
- Besler H, Blümel WD, Heine K, Hüser K, Leser H, Rust U. 1994. Geomorphogenese und Paläoklima Namibias. Eine Problemskizze. *Die Erde* **125**: 139-165.
- Besler H, Blümel WD, Heine K, Hüser K, Leser H, Rust U. 1994. Zum Stand der geomorphologischen Forschung in Namibia: Grundzüge eines Langzeitforschungsprogramms. *Basler Beiträge zur Physiogeographie* **17**: 1-24.
- Besler H, Gerster G. 1985. Dünen - die Wogen der Wüste. *Bild der Wissenschaft*, Stuttgart: 38-47.
- Besler H, Gut S. 1997. Untersuchungen zum Feuchtehaushalt in Dünen am Beispiel der Namib/Namibia. *Kölner Geographische Arbeiten Sonderfolge Afrika* **13**: 39-47.
- Besler H, Marker ME. 1979. Namib sandstone: a distinct lithological unit. *Transactions of the Geological Society of South Africa* **82**: 155-160.
- Besler H, Marker ME, Ollier CD, Selby MJ. 1977. Geomorphological research in the Namib. *Namib Bulletin*, Gobabeb: 6-8.
- Besler H, Pfeiffer L. 1994. The Tertiary proto-erg of the Namib: depositional environment of the Tsondab Sandstone in Namibia. *Journal of the Namibia Scientific Society* **44**: 7-24.
- Bluck BJ, Ward JD, Cartwright J, Swart R. 2007. The Orange River, southern Africa: an extreme example of a wave-dominated sediment dispersal system in the South Atlantic Ocean. *J. geol. Soc. London* **164**: 341-351.
- Bourke MC, Goudie AS. 2009. Varieties of barchan form in the Namib Desert and on Mars. *Aeolian Research* **1**: 45-54.
- Bourke MC, Viles HA. 2007. *A Photographic Atlas of Rock Breakdown Features in Geomorphic Environments*. Tucson: Planetary Science Institute.
- Breton C, Lancaster N, Nickling WG. 2007. Magnitude and frequency of grain flow on a desert sand dune. *Geomorphology*: 1-6.
- Bristow CS, Bailey SD, Lancaster N. 2000. The sedimentary structure of linear sand dunes. *Nature* **406**: 56-59.
- Bristow CS, Duller GAT, Lancaster N. 2007. Age and dynamics of linear dunes in the Namib Desert. *Geology* **35**: 555-558.
- Bristow CS, Lancaster N. 2004. Movement of a small slipfaceless dome dune in the Namib Sand Sea, Namibia. *Geomorphology* **59**: 189-196.

- Bristow CS, Lancaster N, Duller GAT. 2005. Combining ground penetrating radar surveys and optical dating to determine dune migration in Namibia. *Journal of the Geological Society, London* **162**: 315-321.
- Brown LF (Jr), Benson JM, Brink GJ, Doherty S, Jollands A, Jungslager EHA, Keenan JHG, Muntingh A, van Wyk NJS. 1995. Orange Basin. In: Brown LF (Jr), et al. (Eds) *Sequence stratigraphy in offshore South African divergent basins*. AAPG Studies in Geology **41**: 139-184.
- Cagle FRJ. 1975. *Evaporite deposits of the central Namib Desert, Namibia*. MSc, University of New Mexico, Albuquerque: 151 pp.
- Cockcroft MJ, Wilkinson MJ, Tyson PD. 1987. The application of a present-day climatic model to the late Quaternary in southern Africa. *Climatic Change* **10**: 161-181.
- Corbett I.B. 1989. *The sedimentology of diamondiferous deflation deposits within the Sperrgebiet*. Unpubl. PhD. thesis, Univ. Cape Town, 430 pp.
- Corbett I. 1993. The modern and ancient pattern of sandflow through the southern Namib deflation basin, 45-60. In: Pye K, Lancaster N (Eds) *Aeolian sediments - ancient and modern*. Spec. Publ. Int. Assoc. Sedimentol. **16**: 167 pp.
- Deacon J, Lancaster N. 1988. *Late Quaternary palaeoenvironments of southern Africa*. Clarendon Press, Oxford: 2-225.
- Dickinson WW, Ward JD. 1994. Low depositional porosity in eolian sands and sandstones, Namib Desert. *Journal of Sedimentary Research* **A64**: 226-232.
- Eckardt FD. 2001. The origin of sulphates: an example of sulphur isotopic applications. *Progress in Physical Geography* **25**: 512-519.
- Eckardt FD, Drake N, Goudie AS, White K, Viles H. 2001. The role of playas in pedogenic gypsum crust formation in the Central Namib Desert: a theoretical model. *Earth Surface Processes and Landforms* **26**: 1177-1193.
- Eckardt FD, Spiro B. 1999. The origin of sulphur in gypsum and dissolved sulphate in the Central Namib Desert, Namibia. *Sedimentary Geology* **123**: 255-273.
- Eckardt FD, Washington R, Wilkinson MJ. 2001. The origin of dust on the West Coast of Southern Africa. In: *Palaeoecology of Africa and the surrounding islands*. Heine C (Editor), AA Balkema, Lisse, The Netherlands: 207-219.
- Fenwick GA. 1990. *Origin and surface form of the Tsondab sandstone formation, Central Namib Desert*. MSc. University of the Witwatersrand. Johannesburg: 127 pp.
- Fenwick GA. 1991. Grain size and easterly wind influences on dunes of the north central Namib Desert. *Zeitschrift für Geomorphologie N.F.* **35**: 283-292.
- Fryberger SG, Hesp P, Hastings K. 1992. Aeolian granule ripple deposits, Namibia. *Sedimentology* **39**: 319-331.
- Goudie A. 1970. Notes on some major dune types in southern Africa. *The South African Geographical Journal* **52**: 93-101.
- Goudie A. 1972. Climate, weathering, crust formation, dunes, and fluvial features of the central Namib Desert, near Gobabeb, South West Africa. *Madoqua Series II* **1**: 15-31.
- Goudie AS, Cooke RU, Doornkamp JC. 1979. The formation of silt from quartz dune sand by salt-weathering processes in deserts. *Journal of Arid Environments* **2**: 105-112.
- Goudie AS, Eckardt FD. 1999. The evolution of the morphological framework of the central Namib Desert, Namibia, since the early Cretaceous. *Geografiska Annaler* **81A**: 443-458.
- Goudie AS, Parker AG. 1998. Experimental simulation of rapid rock block disintegration by sodium chloride in a foggy coastal desert. *Journal of Arid Environments* **40**: 347-355.
- Goudie AS, Viles HA, Parker AG. 1997. Monitoring of rapid salt weathering in the central Namib Desert using limestone blocks. *Journal of Arid Environments* **37**: 581-598.
- Gut S. 1987. Moisture in the dunes of the Namib Desert. *Namib Bulletin*, Gobabeb: 12.
- Gut S. 1988. *Study of the moisture budget of the dunes of the central Namib Desert*. MSc. Geographisches Institut der Universität Zürich, Zürich: 125 pp.
- Harmse JT. 1980. *Die noordwaartse begrening van die duinsee van die sentrale Namib langs die benedekuseb*. PhD. University of Stellenbosch, Stellenbosch: 229 pp.

- Heine K. 1985. Late Quaternary development of the Kuiseb River valley and adjacent areas, central Namib Desert, South West Africa/Namibia, and palaeoclimatic implications. *Zeitschrift für Gletscherkunde und Glazialgeologie* **21**: 151-157.
- Heine K. 1987. Jungquartäre fluviale Geomorphodynamik in der Namib, Südwestafrika/Namibia. *Zeitschrift für Geomorphologie* **66**: 113-134.
- Heine K. 1990. Klimaschwankungen und klimagenetische Geomorphologie am Beispiel der Namib. *Berliner Geographische Studien* **30**: 221-234.
- Heine K. 1992. On the ages of humid Late Quaternary phases in southern African arid areas (Namibia, Botswana). In: *Palaeoecology of Africa and the surrounding islands*. Heine K (Editor) AA Balkema, Rotterdam: 149-164.
- Heine K. 1998. Climate change over the past 135.000 years in the Namib Desert (Namibia) derived from proxy data. In: *Palaeoecology of Africa and the surrounding islands*. Heine K (Editor) AA Balkema, Rotterdam: 171-198.
- Heine K. 1998. Late Quaternary climate changes in the Central Namib Desert, Namibia. In: *Quaternary Deserts and Climatic Change*. Alsharhan AS, Glennie KW, Whittle GL, Kendall CGStC. (Editors) *Proceedings of the International Conference on Quaternary Deserts and Climatic Change*. AA Balkema, Rotterdam: 293-304.
- Heine K. 2004. Flood reconstructions in the Namib Desert, Namibia and Little Ice Age climatic implications: evidence from slackwater deposits and desert soil sequences. *Journal Geological Society of India* **64**: 535-547.
- Heine K. 2004. Little Ice Age climatic fluctuations in the Namib Desert, Namibia, and adjacent areas: evidence of exceptionally large floods from slack water deposits and desert soil sequences. In: *Palaeoecology of Quaternary drylands (lecture notes in earth sciences 102)*. Smykatz W, Felix-Henningsen P (Editors) Springer Verlag, Berlin: 137-165.
- Heine K, Heine C, Kühn T. 2000. Slackwater deposits of the Namib Desert (Namibia) and paleoclimatic implications. *Zeitblatt Geologischer Paläontologie Teil I* 5/6: 587-613.
- Heine K, Heine JT. 2002. A paleohydrologic reinterpretation of the Homeb silts, Kuiseb River, central Namib Desert (Namibia) and paleoclimatic implications. *Catena* **48**: 107-130.
- Hesp PA, Hastings K. 1998. Width, height and slope relationships and aerodynamic maintenance of barchans. *Geomorphology* **22**: 193-204.
- Hoffmann KH, Constance C, Kohonen J. 1994. *Geological map 2314 – Kuiseb*. Geol. Surv. Namibia, Windhoek.
- Hövermann J. 1978. Formen und Formung in der Pränamib (Flächen-Namib). *Zeitschrift für Geomorphologie N.F.* **30**: 55-73.
- Hövermann J. 1988. The Sahara, Kalahari and Namib Deserts: a geomorphological comparison. *Proceedings: Symposium on the geomorphology of Southern Africa*. Geomorphological Society, Umtata: 71-83.
- Huxley J. 2007. Changeless change? the reversing dunes of Walvis Bay, Namibia: A quantitative and qualitative approach to barchan migration and morphology. BA (Hons). University of Oxford, School of Geography, Oxford: 67 pp.
- Jacob RJ. 2005. *The erosional and Cenozoic depositional history of the lower Orange River, southwestern Africa*. Unpubl. PhD thesis, Univ. Glasgow, Vol. 1 – text, 167 pp, Vol. 2 – figures and appendices, 187 pp.
- Jacob RJ, Bluck BJ, Ward JD. 1999. Tertiary-age diamondiferous fluvial deposits of the lower Orange River valley, southwestern Africa. *Econ. Geol.* **94**: 749-758.
- Kocurek G, Lancaster N, Carr M, Frank A. 1999. Tertiary Tsondab Sandstone: preliminary bedform reconstruction and comparison to modern Namib Sand Sea dunes. *Journal of African Earth Sciences* **29**: 629-42.
- Lancaster IN. 1979. Quaternary environments in the arid zone of southern Africa. *Environmental Studies Occasional Paper*: 1-77.
- Lancaster N. 1980. Dune forms and processes in the Namib Sand Sea. *Namib Bulletin*, Gobabeb: 3-4.
- Lancaster N. 1980. Dune systems and palaeoenvironments in southern Africa. *Palaeontology of Africa* **23**: 185-189.

- Lancaster N. 1980. The formation of seif dunes from barchans - supporting evidence for Bagnold's model from the Namib Desert. *Zeitschrift für Geomorphologie N.F.* **24**: 160-167.
- Lancaster N. 1981. Aspects of the morphometry of linear dunes of the Namib Desert. *South African Journal of Science* **77**: 366-368.
- Lancaster N. 1981. Grain size characteristics of Namib Desert linear dunes. *Sedimentology* **28**: 115-122.
- Lancaster N. 1981. Palaeoenvironmental implications of fixed dune systems in southern Africa. *Palaeogeography, Palaeoclimatology, Palaeoecology* **33**: 327-346.
- Lancaster N. 1982. Linear dunes. *Progress in Physical Geography* **6**: 475-504.
- Lancaster N. 1982. Spatial variations in linear dune morphology and sediments in the Namib sand sea. In: *Palaeoecology of Africa and the surrounding islands*. Coetzee JA, van Zinderen Bakker EM Sr. (Editors) AA Balkema, Rotterdam: 173-182.
- Lancaster N. 1983. Controls of dune morphology in the Namib sand sea. In: *Eolian sediments and processes*. Brookfield ME, Ahlbrandt TS (Editors) Elsevier Science Publishers B.V., Amsterdam: 261-289 pp.
- Lancaster N. 1983. Linear dunes of the Namib sand sea. *Zeitschrift für Geomorphologie N.F.* **45**: 27-49.
- Lancaster N. 1984. Aeolian sediments, processes and land forms. *Journal of Arid Environments* **7**: 249-254.
- Lancaster N. 1984. Characteristics and occurrence of wind erosion features in the Namib Desert. *Earth Surface Processes and Landforms* **9**: 469-478.
- Lancaster N. 1984. Late Cenozoic fluvial deposits of the Tsondab Valley, central Namib Desert. *Madoqua* **13**: 257-269.
- Lancaster N. 1984. Palaeoenvironments in the Tsondab Valley, central Namib Desert. In: *Palaeoecology of Africa and the surrounding islands Volume 16*. Coetzee JA, van Zinderen Bakker EM Sr. (Editors) AA Balkema, Rotterdam: 411-419.
- Lancaster N. 1985. Variations in wind velocity and sand transport on the windward flanks of desert sand dunes. *Sedimentology* **32**: 581-593.
- Lancaster N. 1985. Winds and sand movements in the Namib Sand Sea. *Earth Surface Processes and Landforms* **10**: 607-619.
- Lancaster N. 1988. Controls of eolian dune size and spacing. *Geology* **16**: 972-975.
- Lancaster N. 1988. The development of large aeolian bedforms. *Sedimentary Geology* **55**: 69-89.
- Lancaster N. 1988. On desert sand seas. *Episodes* **11**: 12-16.
- Lancaster N. 1989. *The Namib sand sea. Dune forms, processes and sediments*. AA Balkema, Rotterdam: 180 pp.
- Lancaster N. 1989. Star dunes. In: *Progress in Physical Geography*. Edward Arnold Limited, London: 67-91.
- Lancaster N. 1990. Palaeoclimatic evidence from sand seas. *Palaeogeography, Palaeoclimatology, Palaeoecology* **76**: 279-290.
- Lancaster N. 1990. Regional aeolian dynamics in the Namib. In: *Namib ecology 25 years of Namib research*. Seely MK (Editor) Transvaal Museum, Pretoria: 39-46.
- Lancaster N. 1995. *Geomorphology of desert dunes*. Routledge Physical Environment Series. Volume 9. Richards K (Editor) Routledge, London & New York: 290 pp.
- Lancaster N. 1996. Desert environments. In: *The physical geography of Africa*. Adams WM, Goudie AS, Orme AR (Editors) Oxford University Press, Oxford: 211-237.
- Lancaster N. 1996. Field studies of sand patch initiation processes on the northern margin of the Namib Sand Sea. *Earth Surface Processes and Landforms* **21**: 947-954.
- Lancaster N. 1996. The role of field experiments in studies of dune dynamics and morphology. *Annals of Arid Zone* **35**: 171-186.
- Lancaster N. 1998. Dune morphology, chronology, and quaternary climatic change. In: *Quaternary Deserts and Climatic Change. Proceedings of the International Conference on Quaternary Deserts and Climatic Change*. Alsharhan AS, Glennie KW, Whittle GL, Kendall CGStC (Editors) AA Balkema, Rotterdam: 339-349.
- Lancaster N. 2002. How dry was dry? - late Pleistocene palaeoclimates in the Namib Desert. *Quaternary Science Review* **21**: 769-782.
- Lancaster N, Goudie AS. 1994. Desert landforms. In: *Deserts, The illustrated library of the earth*. Seely M (Editor) Weldon Owen Production, McMahons Point, Australia: 26-32.

- Lancaster N, Ollier CD. 1983. Sources of sand for the Namib Sand Sea. *Zeitschrift für Geomorphologie N.F.* **45**: 71-83.
- Lancaster N, Schaber GG, Teller JT. 2000. Orbital radar studies of paleodrainages in the Central Namib Desert. *Remote Sensing of the Environment* **71**: 216-225.
- Lancaster N, Seely M. 1999. *Cenozoic landforms and deposits of the western Kalahari and central Namib Desert, Namibia*. International Quaternary Association Field Trip, Desert Research Foundation of Namibia, Windhoek: 59 pp.
- Lancaster N, Teller JT. 1988. Interdune deposits of the Namib Sand Sea. *Sedimentary Geology* **55**: 91-107.
- Livingstone I. 1982. Dynamics of Namib linear dunes. *Namib Bulletin*, Gobabeb: 10-11.
- Livingstone I. 1985. *The dynamics of sand transport on a Namib linear dune*. PhD. University of Oxford, Oxford: 318 pp.
- Livingstone I. 1986. Geomorphological significance of wind flow patterns over a Namib linear dune. In: *Aeolian geomorphology*. Nickling WG (Editor) Allen & Unwin, Boston: 97-112.
- Livingstone I. 1987. Grain-size variation on a 'complex' linear dune in the Namib Desert. In: *Desert sediments: ancient and modern*. Frosdick L, Reid I (Editors) *Geological Society special publication* no. 35: 281-291 pp.
- Livingstone I. 1987. Photographic evidence of seasonal change in a secondary form on a 'complex' linear dune. *Madoqua* **15**: 237-241.
- Livingstone I. 1987. Using the response diagram to recognise zones of aeolian activity: a note on evidence from a Namib dune. *Journal of Arid Environments* **13**: 25-30.
- Livingstone I. 1988. New models for the formation of linear sand dunes. *Geography* **73**: 105-115
- Livingstone I. 1989. Applying Besler's response diagram: a comment. *Zeitschrift für Geomorphologie N.F.* **33**: 499-502.
- Livingstone I. 1989. Monitoring surface change on a Namib linear dune. *Earth Surface Processes and Landforms* **14**: 317-332.
- Livingstone I. 1989. Temporal trends in grain-size measures on a linear sand dune. *Sedimentology* **36**: 1017-1022.
- Livingstone I. 1990. Desert sand dune dynamics: review and prospect. In: *Namib ecology 25 years of Namib research*. Seely M (Editor) Transvaal Museum, Pretoria: 47-53.
- Livingstone I. 1993. A decade of surface change on a Namib linear dune. *Earth Surface Processes and Landforms* **18**: 661 - 664.
- Livingstone I. 2003. A twenty-one-year record of surface change on a Namib linear dune. *Earth Surface Processes and Landforms* **28**: 1025-1031.
- Livingstone I, Bristow C, Bryant RG, Bullard J, White K, Wiggs GFS, Baas ACW, Bateman MD, Thomas DSG. 2010. The Namib Sand Sea digital database of aeolian dunes and key forcing variables. *Aeolian Research* **2**: 93-104.
- Marker ME. 1977. Aspects of the geomorphology of the Kuiseb River, South West Africa. *Madoqua* **10**: 199-206.
- Marker ME. 1977. A long-return geomorphic event in the Namib Desert, South West Africa. *Area* **9**: 209-213.
- Marker ME. 1979. Relict fluvial terraces on the Tsondab Flats, Namibia. *Journal of Arid Environments* **2**: 113-117.
- Marker ME. 1981. The geomorphological significance of some central Namib materials. *Journal of the SWA Scientific Society* **35**: 49-55.
- Marker ME. 1983. Fluvial deposits of the middle Kuiseb valley, Namibia. *Journal of Arid Environments* **6**: 333-348.
- Marker ME, Müller D. 1978. Relict vlei silts of the middle Kuiseb River valley, South West Africa. *Madoqua* **11**: 151-162.
- McKee ED. 1982. Sedimentary structures in dunes of the Namib Desert, South West Africa. *The Geological Society of America Special paper*: 1-64.
- McLachlan A. 1986. Studies of sand dunes. *South African Journal of Science* **82**: 243.
- Miller RMcG. 2008. *The Geology of Namibia*. Vols. 1 -3, Geological Survey of Namibia.
- Miller RMcG, Sawyer EW, Hill RS, Engelbrecht LNJ. 1975. *Geological map of the Conception Bay – Meob Bay area, 2414*. Geol. Surv. Namibia, scale 1:250 000.

- Miyamoto S. 2010. Late Pleistocene sedimentary environment of the "Homeb Silts" deposits, along the middle Kuiseb River in the Namib Desert, Namibia. *African Study Monographs Supplement*: 51-66.
- Muntingh A. 1993. Geology, prospects in Orange basin offshore western South Africa. *Oil Gas J*: 106-109.
- Muntingh A, Brown LF (Jr). 1993. Sequence stratigraphy of petroleum plays, post-rift Cretaceous rocks (Lower Aptian to Upper Maastrichtian), Orange Basin, western offshore, South Africa, 71-98. In: Weimer, P. and Posamentier, H (Eds) *Siliciclastic sequence stratigraphy: recent developments and applications*. Mem. Amer. Assoc. Petrol. Geol. **58**: 492 pp.
- Nagtegaal PJC. 1973. Adhesion-ripple and barchan-dune sands of the recent Namib (SW Africa) and Permian Rotliegend (NW Europe) deserts. *Madoqua*, Series II **2**: 5-19.
- Ollier CD. 1977. Outline geological and geomorphic history of the central Namib Desert. *Madoqua* **10**: 207-212.
- Ollier CD, Seely MK. 1977. Patterned ground near Gobabeb, central Namib Desert. *Madoqua* **10**(3): 13-214.
- Powell T. 2001. *An investigation into the nature and origin of dry aeolian dust deposition in the central Namib desert, Namibia*. Honours. University of Oxford, Oxford: 165 pp.
- Rogers J. 1977. Sedimentation on the continental margin off the Orange River and the Namib Desert. *Bull. mar. Geosci. geol. Surv. S. Afr. & Univ. Cape Town*, **7**: 162 pp.
- Rust U, Wieneke F. 1974. Studies on the Gramadulla formation in the middle part of the Kuiseb River, South West Africa. *Madoqua*, Series II **3**: 5-15.
- Rust U, Wieneke F. 1976. *Geomorphologie der küstennahen Zentralen Namib (Südwestafrika)*. Accreditation Ludwig-Maximilians-Universität, München, Germany: 9-74 pp.
- Rust U, Wieneke F. 1980. A reinvestigation of some aspects of the evolution of the Kuiseb River valley upstream of Gobabeb, South West Africa. *Madoqua* **12**: 163-173.
- Scholz H. 1963. *Studien über die Bodenbildung zwischen Rehoboth und Walvis Bay*. PhD. (Dr. agr.) Rheinischen Friedrich-Wilhelm-Universität, Bonn: 184 pp.
- Scholz H. 1968. Die Böden der Wüste Namib/Südwestafrika. *Zeitschrift für Pflanzenernährung und Bodenkunde* **119**: 91-107.
- Scholz H. 1972. The soils of the central Namib Desert with special consideration of the soils in the vicinity of Gobabeb. *Madoqua* Series II **1**: 33-51.
- Seely MK, Mitchell D. 1986. Termite casts in Tsondab sandstone? In: *Palaeoecology of Africa and the surrounding islands*. Van Zinderen Bakker EMS, Coetzee JA, Scott L (Editors) AA Balkema, Rotterdam: 109-112.
- Selby MJ. 1976. Some thoughts on the geomorphology of the central Namib Desert. *Namib Bulletin*, Gobabeb: 5-6.
- Selby MJ. 1977. Paleowind directions in the central Namib Desert, as indicated by ventifacts. *Madoqua* **10**: 195-198.
- Selby MJ, Hendy CH, Seely MK. 1979. A late Quaternary lake in the central Namib Desert, southern Africa, and some implications. *Palaeogeography, Palaeoclimatology, Palaeoecology* **26**: 37-41.
- Siesser WG, Salmon D. 1979. Eocene marine sediments in the Sperrgebiet, South West Africa. *Ann. S. Afr. Mus.* **79**(2): 9-34.
- Slattery MJ. 1990. Barchan migration on the Kuiseb River Delta, Namibia. *South African Geographical Journal* **72**: 5-10.
- Smith RMH, Mason TR. 1998. Sedimentary environments and trace fossils of Tertiary oasis deposits in the central Namib Desert, Namibia. *Palaios* **13**: 547-559.
- Smith RMH, Mason TR, Ward JD. 1993. Flash-flood sediments and ichnofacies of the Late Pleistocene Homeb Silts, Kuiseb River, Namibia. *Sedimentary Geology* **85**: 579-599.
- Stocken CG. 1962. *The diamond deposits of the Sperrgebiet, South West Africa*. Excursion Guide, 5th Congr., Geol. Soc. S. Afr. 15 pp.
- Teller JT, Lancaster N. 1986. History of sediments at Khommabes, central Namib Desert. *Madoqua* **14**: 409-420.
- Teller JT, Lancaster N. 1986. Lacustrine sediments at Narabeb in the central Namib Desert, Namibia. *Palaeogeography, Palaeoclimatology, Palaeoecology* **56**: 177-195.
- Teller JT, Lancaster N. 1987. Description of Late Cenozoic sediments of Narabeb, central Namib Desert. *Madoqua* **15**: 163-167.

- Teller JT, Rutter N, Lancaster N. 1990. Sedimentology and paleohydrology of late Quaternary lake deposits in the northern Namib sand sea, Namibia. *Quaternary Science Reviews* **9**: 343-364.
- Teller JT, Rybak M, Rybak I, Lancaster N, Rutter NW, Ward JD. 1988. Diatoms and other fossil remains in calcareous lacustrine sediments of the northern Namib Sand Sea, South West Africa/Namibia. *Proceedings: The symposium on the geomorphology of southern Africa. Geomorphological studies in southern Africa* Dardis GF, Moon BP (Editors) Transkei: AA Balkema: 159-174.
- Van der Wateren FM, Dunai TJ. 2001. Late Neogene passive margin denudation history - cosmogenic isotope measurements from the central Namib desert. *Global and Planetary Change* **30**: 271-307.
- Vermeesch P, Fenton CR, Kober F, Wiggs GFS, Bristow CS, Xu S. 2010. Sand residence times of one million years in the Namib Sand Sea from cosmogenic nuclides. *Nature Geoscience*: 1-4.
- Viles H. 2005. Microclimate and weathering in the central Namib Desert, Namibia. *Geomorphology* **67**: 189-209.
- Viles HA. 2010. *Rock breakdown on Earth and Mars - experiments in Namibia*. Interim report. University of Oxford. Oxford: 1-4.
- Viles H, Goudie A. 2000. Weathering, geomorphology and climatic variability in the Central Namib Desert. In: *Linking climate change to land surface change*. McLaren SJ, Kniveton DR (Editors) Kluwer, Dordrecht: 65-82.
- Viles HA, Goudie AS. 2007. Rapid salt weathering in the coastal Namib desert: implications for landscape development. *Geomorphology* **85**: 49-62.
- Viles HA, Taylor MP, Nicholl K, Neumann S. 2007. Facies evidence of hydroclimatic regime shifts in tufa deposition sequences from the arid Naukluft Mountains, Namibia. *Sedimentary Geology* **195**: 39-53.
- Walden J, White K. 1997. Investigation of the controls on dune colour in the Namib Sand Sea using mineral magnetic analyses. *Earth and Planetary Science Letters* **152**: 187-201.
- Walden J, White K, Drake NA. 1996. Controls on dune colour in the Namib sand sea: preliminary results. *Journal of African Earth Sciences* **22**: 349-353.
- Walden J, White KH, Kilcoyne SH, Bentley PM. 2000. Analyses of iron oxide assemblages within Namib dune sediments using high field remanence measurements (9T) and Mossbauer analysis. *Journal of Quaternary Science* **15**: 185-195.
- Ward JD. 1982. Aspects of a suite of Quaternary conglomeratic sediments in the Kuiseb Valley, Namibia. In: *Palaeoecology of Africa and the surrounding islands*. Volume 15. Coetzee JA, van Zinderen Bakker EM Sr. (Editors) AA Balkema, Rotterdam: 211-216.
- Ward JD. 1984. *Aspects of the Cenozoic geology in the Kuiseb Valley, central Namib desert*. PhD. Department of Geology, University of Natal, Pietermaritzburg: 310 pp.
- Ward JD. 1984. A reappraisal of the cenozoic stratigraphy in the Kuiseb valley of the central Namib Desert. In: *Late Cainozoic palaeoclimates of the Southern Hemisphere. Proceedings of an International Symposium by the South African Society for Quaternary Research*. Vogel JC (Editor) AA Balkema, Rotterdam: 455-464.
- Ward JD. 1986. Dune dynamics along the northern boundary of the main Namib Sand Sea, central Namib Desert. *Proceedings: Structure and function of sand dune ecosystems*. Van der Merwe D, McLachlan A, Hesp P (Editors) Institute for Coastal Research, Port Elizabeth: 23-24.
- Ward JD. 1987. *The Cenozoic succession in the Kuiseb Valley, central Namib Desert*. Geological Survey of South West Africa/Namibia & Department of Economic Affairs, Windhoek: 5-124.
- Ward JD. 1987. Tsondab Sandstone formation - extensive Tertiary desert deposits in the central Namib. *South African Journal of Science* **83**: 507.
- Ward JD. 1988. Eolian, fluvial and pan (playa) facies of the tertiary Tsondab Sandstone formation in the central Namib Desert, Namibia. *Sedimentary Geology* **55**: 143-162.
- Ward JD. 1988. On an interpretation of the Oswater Conglomerate Formation, Kuiseb Valley, Namib Desert. In: *Palaeoecology of Africa and the surrounding islands*. Heine K (Editor) AA Balkema, Rotterdam: 119-125.
- Ward JD, Seely MK. 1989. *Geomorphological aspects of dunes in the central Namib Desert. Dunes '89 excursion 1A field guide*, Desert Ecological Research Unit, Gobabeb: 95 pp.

- Ward JD, von Brunn V. 1985. Geological history of the Kuiseb Valley west of the escarpment. In: *The Kuiseb environment: the development of a monitoring baseline*. Huntley BJ (Editor) *South African National Scientific Programmes Report no. 106*, Pretoria: 21-25.
- Ward JD, von Brunn V. 1985. Sand dynamics along the lower Kuiseb River. In: *The Kuiseb environment: the development of a monitoring baseline*. Huntley BJ (Editor) *South African National Scientific Programmes Report no. 106*, Pretoria: 51-72.
- Watson A. 1979. Gypsum crusts in deserts. *Journal of Arid Environments* **2**: 3-20.
- Watson A. 1980. Vegetation polygons in the central Namib Desert near Gobabeb. *Madoqua* **11**: 315-325.
- Watson A. 1985. Structure, chemistry and origin of gypsum crusts in southern Tunisia and the Central Namib Desert. *Sedimentology* **32**: 855-75.
- Watson A. 1988. Desert gypsum crusts as palaeoenvironmental indicators: a micropetrographic study of crusts from southern Tunisia and the central Namib Desert. *Journal of Arid Environments* **15**: 19-42.
- Watson A. 1986. Grain-size variations on a longitudinal dune and a barchan dune. *Sedimentary Geology* **46**: 49-66.
- White K, Walden J, Drake N, Eckardt F, Settle J. 1997. Mapping the iron oxide content of dune sands, Namib Sand Sea, Namibia, using Landsat Thematic Mapper data. *Remote Sens. Environ.* **62**: 30-39.
- Wieneke F, Rust U. 1973. Klimageomorphologische Phasen in der Zentralen Namib (Südwestafrika). *Mitteilungen der Geographischen Gesellschaft München* **58**: 79-96.
- Wilkinson MJ. 1988. Arid landscapes. In: *The geomorphology of southern Africa*. Moon BP, Dardis GF (Editors) Southern Book Publishers (Pty) Ltd, Halfway House: 78-102.
- Wilkinson MJ. 1988. Linear dunes in the central Namib Desert: theoretical and chronological perspectives from wind streaks. In: *Geomorphological studies in southern Africa. Proceedings of the Symposium on the geomorphology of southern Africa*. Dardis GF, Moon BP (Editors) AA Balkema, Rotterdam: 85-113.
- Wilkinson MJ, Hems DR, Whitehead VS. 1992. Albedo patterns and gypsum generation in the Central Namib Desert: Land, sea and air interactions on an arid west coast. *Geoscience and Remote Sensing Symposium 1992*, 2: 1565-7.
- Wood K. 2007. *The role of dust in the weathering of arid environments: a preliminary investigation*. BA (Hons), School of Geography, University of Oxford, Oxford: 108 pp.

Institutions

- Anonymous. 2002. The place of the fig tree - centre for research and learning. *Conservation and the environment in Namibia*. Windhoek: 14-15.
- Coineau Y. 1994. Gobabeb - une station d'écologie au coeur du désert du Namib. *Emenir*, Auxerre, France: 8-10.
- Henschel IA. 2006. Die wissenschaftliche Bibliothek in Gobabeb. *Society for Scientific Development* **38**: 9-10.
- Henschel, IA, Henschel JR. 2007. DRFN & Gobabeb comprehensive bibliography. Desert Research Foundation of Namibia & Gobabeb Training and Research Centre: 79 pp.
- Henschel J. 2003. Gobabeb Training and Research Centre. *Aardvark Newsletter of the Zoological Society of Southern Africa*, Pretoria: 79-82.
- Henschel J. 2006. Gobabeb Training and Research Centre. *Newsletter of the Arachnological Society of Africa*, Pretoria: 8.
- Henschel J. 2010. Fifty years of research at Gobabeb. *Newsletter Namibia Scientific Society* **51**: 36-37.
- Henschel J, Pauw J, Banyikwa F, Brito R, Chabwela H, Palmer T, Ringrose S, Santos L, Siteo A, van Jaarsveld A. 2003. Developing the Environmental Long-Term Observatories Network of Southern Africa (ELTOSA). *South African Journal of Science* **99**: 100-108.
- Henschel JR, Seely MK, Zeidler J. 2000. Long-term ecological research at Gobabeb: gaining and applying knowledge about a highly variable environment. *Journal of the Namibia Scientific Society* **48**: 89-115.
- Holtzhausen JA. 1985. The Namib Desert Research Institute - Gobabeb. *Archimedes*, Pretoria **27**(1): 14-15.

- Kolberg H, Craven P. Ongoing. *Computerised Herbarium of Plants in Namibia (CHOPIN)*.
- Lawrence RF. 1960. The Namib Desert Biological Station. *South African Journal of Science* **56**: 90.
- Lawrence RF. 1977. A history of the Namib Desert Research Station to 1970. *Namib Bulletin*, Gobabeb: pages 3-5.
- Lawrence RF, Seely MK. 1979. Gobabeb - Namib Desert Research Station. *South West Africa Annual Yearbook*, Windhoek: 117-125.
- Nkandi K. 2002. *Environmental Research Centre a design of Gobabeb*. MSc. University of Port Elisabeth, Port Elisabeth: 66.
- Nöckler HC. 1963. *Zur Einweihung der Wüstenforschungsstation Gobabeb*. Society for Scientific Development, Swakopmund.
- Oldach G. 1993. Die Wüste lebt: Über die Wüstenforschungsstation Gobabeb. *Namibia Magazin*, Göttingen, Germany: 20-21.
- Seely MK, Henschel JR, Zeidler J, Shanyengana ESC. 2000. Namib research: its development at Gobabeb and implications for Namibia. *Journal of the Namibia Scientific Society* **48**: 62-88.
- Seely MK, Sguazzin TM. 1992. Gobabeb: arid zone research in Namibia. *Journal of the Namibian Scientific Society* **43**: 133-145.
- Walboom GJ. 1961. The Namib Desert Research Station. *Journal S.W.A. Scientific Society, Windhoek* **15**: 71-75.
- Ward V, Malan L. 1990. Desert Ecological Research Unit of Namibia: bibliography of research at Gobabeb. In: *Namib ecology 25 years of Namib research*. Seely MK (Editor) Transvaal Museum, Pretoria: 211-222.
- Zeidler J. 1996. Die Desert Research Foundation of Namibia (DRFN) und der Forschungsstation Gobabeb, Namib-Naukluft Park, Namibia. Desert Ecological Research Unit & Desert Research Foundation of Namibia, Gobabeb: 1-7.

Invertebrate behaviour, physiology and ecology – arachnids

- Birkhofer K. 2001. Territorial behaviour of *Leucorchestris arenicola* (Araneae: Sparassidae). Diploma. Technische Universität Darmstadt, Darmstadt: 99 pp.
- Birkhofer K, Henschel JR, Scheu S. 2006. Spatial-pattern analysis in a territorial spider: evidence for multi-scale effects. *Ecography* **29**: 641-648.
- Birkhofer K, Scheu S, Henschel JR. 2006. Does territorial behaviour in the desert-living spider *Leucorchestris arenicola* Lawrence (Araneae: Sparassidae) affect its spatial distribution? *Bulletin of the British arachnological Society* **13**: 341-346.
- Bridges CR, le Roux JM, van Aardt WJ. 1997. Ecophysiological adaptations to dry thermal environments measured in two unrestrained Namibian scorpions, *Parabuthus villosus* (Buthidae) and *Opisthophthalmus flavescens* (Scorpionidae). *Physiological Zoology* **70**: 244-256.
- Brownell P, Polis G (Editors). 2001. Scorpion biology and research. Oxford University Press, Oxford: 431 pp.
- Cloudsley-Thompson JL. 2000. Biological rhythms in arachnida. *Mem. Soc. entomol. ital.* **78**: 251-273.
- Eisinger D, Jeltsch F, Henschel J, Ulbrich K, Lubin Y, Wissel C. 1998. Das lokale Ausbreitungsmuster der Wüstenspinne *Seothyra henscheli* - ein räumlich-explizites gitterbasiertes Simulationsmodell. *Verhandlungen der Gesellschaft für Ökologie* **28**: 141-150.
- Henschel JR. 1990. Spiders wheel to escape. *South African Journal of Science* **86**: 151-152.
- Henschel JR. 1990. The biology of *Leucorchestris arenicola* (Araneae: Heteropodidae), a burrowing spider of the Namib dunes. In: *Namib ecology 25 years of Namib research*. Seely MK (Editor) Transvaal Museum, Pretoria: 115-127.
- Henschel JR. 1991. A trap to capture burrowing arachnids. *The Journal of Arachnology* **19**:150-152.
- Henschel JR. 1994. Diet and foraging behaviour of huntsman spiders in the Namib dunes (Araneae: Heteropodidae). *Journal of Zoology, London* **234**: 239-251.
- Henschel JR. 1994. The Namibian wheel spider. In: *Deserts*, The illustrated library of the earth. Seely M (Editor) Weldon Owen Production, McMahons Point, Australia: 93.
- Henschel J. 1995. Ein handliches Vakuumsammelgerät für die Erfassung von Spinnen und Insekten - A handy vacuum collector for catching spiders and insects. *Arachnologische Mitteilungen* **9**: 67-70.
- Henschel JR. 1997. Psammophily in Namib desert spiders. *Journal of Arid Environments* **37**: 695-707.

- Henschel JR. 1998. Predation on social and solitary individuals of the spider *Stegodyphus dumicola* (Araneae, Eresidae). *The Journal of Arachnology* **26**: 61-69.
- Henschel JR. 2001. Long-distance movements by males of the Dancing White Lady spider (*Leucorchestris arenicola*, Sparassidae) across Namib dunes (abstract). *Proceedings: 15th International Congress of Arachnology*, Badplaas, South Africa: 1.
- Henschel JR. 2002. Long-distance wandering and mating by the dancing white lady spider (*Leucorchestris arenicola*) (Araneae, Sparassidae) across Namib dunes. *The Journal of Arachnology* **30**: 321-330.
- Henschel JR, Jocqué R. 1994. Bauble spiders: a new species of *Achaearanea* (Araneae: Theridiidae) with ingenious spiral retreats. *Journal of Natural History* **28**: 1287-1295.
- Henschel JR, Lubin YD. 1992. Environmental factors affecting the web and activity of a psammophilous spider in the Namib Desert. *Journal of Arid Environments* **22**: 173-189.
- Henschel JR, Lubin YD. 1994. Foraging behaviour of the Namib dune spider *Seothyra* (Eresidae) in relation to prey availability. *Proceedings: Abstracts of the 15th European Colloquium of Arachnology*, České Budějovice, Czech Republic.
- Henschel JR, Lubin YD. 1997. A test of habitat selection at two spatial scales in a sit-and-wait predator: a web spider in the Namib desert dunes. *Journal of Animal Ecology* **66**: 401-413.
- Henschel J, Mahsberg D, Stumpf H. 1996. Mass-length relationships of spiders and harvestmen (Araneae and Opiliones). *Revue Suisse de Zoologie hors série*: 265-268.
- Henschel JR, Schneider J, Lubin YD. 1995. Dispersal mechanisms of *Stegodyphus* (Eresidae): do they balloon? *The Journal of Arachnology* **23**: 202-204.
- Henschel JR, Schneider J, Meikle T. 1996. Does group-living or aggregation of spiders of the genus *Stegodyphus* affect parasitism by pompilid wasps? *Bulletin of the British arachnological Society* **10**: 138-140.
- Lamoral BH. 1972. New and little known scorpions and solifuges from the Namib Desert, South West Africa. *Madoqua Series II* **1**: 117-131.
- Lubin Y, Henschel J. 1996. The influence of food supply on foraging behaviour in a desert spider. *Oecologia* **105**: 64-73.
- Lubin Y, Henschel JR, Baker MB. 2001. Costs of aggregation: shadow competition in a sit-and-wait predator. *Oikos* **95**: 59-68.
- Lubin YD, Henschel JR. 1990. Foraging at the thermal limit: burrowing spiders (*Seothyra*, Eresidae) in the Namib desert dunes. *Oecologia* **84**: 461-467.
- Norgaard T. 2005. Nocturnal navigation in *Leucorchestris arenicola* (Araneae, Sparassidae). *The Journal of Arachnology* **33**: 533-540.
- Norgaard T. 2006. The night-time temporal window of locomotor activity in the Namib Desert long-distance wandering spider *Leucorchestris arenicola*. *Journal of Comparative Physiology A* **192**: 69-82.
- Norgaard T. 2006. *Nocturnal long-distance navigation in the Namib Desert wandering spider Leucorchestris arenicola* (Araneae, Sparassidae). PhD. Universität Zürich, Zürich: 119 pp.
- Norgaard T. 2008. Nocturnal spider navigators in the Namib Desert. *Newsl. Br. arachnol. Soc.* **112**: 10-12.
- Norgaard T, Henschel JR, Wehner R. 2003. Long-distance navigation in the wandering desert spider *Leucorchestris arenicola*: can the slope of the dune surface provide a compass cue? *Journal of Comparative Physiology A* **189**: 801-809.
- Norgaard T, Henschel JR, Wehner R. 2006. Tracking the Namib Desert spider *Leucorchestris arenicola* - reading the story in the sand (Arachnida, Araneae, Sparassidae). *Senckenbergiana biologica* **86**: 211-218.
- Norgaard T, Henschel JR, Wehner R. 2007. Use of local cues in the night-time navigation of the wandering desert spider *Leucorchestris arenicola* (Araneae, Sparassidae). *Journal of Comparative Physiology A* **193**: 217-222.
- Norgaard T, Nilsson D, Henschel JR, Garm A, Wehner R. 2008. Vision in the nocturnal wandering spider *Leucorchestris arenicola* (Araneae: Sparassidae). *Journal of Experimental Biology* **211**: 816-823.
- Peters HM. 1992. On the burrowing behaviour and the production and use of silk in *Seothyra*, a sand-inhabiting spider from the Namib Desert (Arachnida, Araneae, Eresidae). *Verhandlungen des naturwissenschaftlichen Vereins Hamburg (NF)* **33**: 191-211.

- Polis GA, Seely MK. 1990. Imbibition of precipitated fog by Namib Desert scorpions. *The Journal of Arachnology* **18**: 362-363.
- Rössl R, Henschel JR. 1999. Ecology and diet of *Psammoduan deserticola* (Simon) (Araneae: Zodariidae). *Bulletin of the British arachnological Society* **11**: 155-157.
- Turner JS, Henschel JR, Lubin YD. 1993. Thermal constraints on prey-capture behavior of a burrowing spider in a hot environment. *Behavioral Ecology and Sociobiology* **33**: 35-43.
- Ward D, Henschel JR. 1992. Experimental evidence that a desert parasitoid keeps its host cool. *Ethology* **92**: 135-142.
- Ward D, Henschel JR. 1993. A wasp keeps its zombie-like victims cool. *Natural History* **102**: 42.
- Wharton RA. 1987. Biology of the diurnal *Metasolpuga picta* (Kraepelin) (Solifugae, Solpugidae) compared with that of nocturnal species. *Journal of Arachnology* **14**: 363-383.

Invertebrate behaviour, physiology and ecology – others

- Bolton B, Marsh AC. 1989. The Afrotropical thermophilic ant genus *Ocymyrmex* (Hymenoptera: Formicidae). *Journal of Natural History* **23**: 1267-1308.
- Cloudsley-Thompson JL. 1993. Successful desert animals - scorpions, beetles, lizards. *Libyan Studies* **24**: 143-156.
- Coineau Y, Seely MK. 1983. Mise en évidence d'un peuplement de microarthropodes dans les sables fins des dunes du Namib central. In: *New Trends in Soil Biology*. Lebrun P, Andre HM, de Medts A, Gregoire-Wibo C, Wauthy G (Editors) Dieu-Brichart, Louvain-la-Neuve, Belgium: 652-654 pp.
- Costa G, Leonardi ME, Petralia A. 1984. First notes on the orientation of *Pachyphaleria capensis* Laporte, an endemic tenebrionid beetle of the south western African coasts. *Monitore Zoologico Italiano* **18**: 164-165.
- Costa G, Leonardi M-E, Petralia A. 1984. Orientation of *Pachyphaleria capensis* (Laporte) endemic tenebrionid beetle of South-Western African coasts. *Bolletino delle Sedute dell'Accademia Gioena di Scienze Naturale in Catania* **17**: 7-24.
- Costa G, Leonardi M-E, Petralia A. 1984. Reproductive behaviour of the sandy cricket *Brachytrupes membranaceus* (Drury). *Bolletino delle Sedute dell'Accademia Gioena di Scienze Naturali in Catania* **17**: 43-63.
- Costa G, Leonardi M-E, Petralia A. 1987. Day-time spatial orientation of *Pachyphaleria capensis* (Laporte), an endemic tenebrionid beetle of the South West African coast. *Madoqua* **15**: 169-174.
- Costa G, Leonardi M-E, Petralia A. 1987. Reproductive behaviour of the giant cricket *Brachytrupes membranaceus* (Drury) in the Namib. *Madoqua* **15**: 217-228.
- Costa G, Petralia A. 1984. Observations on reproductive behaviour of *Brachytrupes membranaceus* (Drury) (Orthoptera Gryllidae) (abstract). *Proceedings: Italian Society for the Study of Animal Behaviour*. Italian Society of Entomology, Turin: 166.
- Crawford CS, Seely MK. 1994. Detritus mass loss in the Namib Desert dunefield: influence of termites, gerbils and exposure to surface conditions. *Journal of African Zoology* **108**: 49-54.
- Curtis B. 1982. *Camponotus detritus*. *Namib Bulletin*, Gobabeb: 9.
- Curtis B. 1991. Notes on the behaviour and potential food plants of the snail, *Trigonephrus haughtoni* Connolly (Mollusca: Dorcasiidae), in the southern Namib Desert. *Cimbebasia* **13**: 99-104.
- Curtis BA. 1983. Ants adapt to desert conditions. *Scientific Progress* **16**: 2-3.
- Curtis BA. 1983. *Behavioural and physiological ecology of the Namib desert dune ant, Camponotus detritus* Emery. MSc, University of Cape Town, Cape Town: 212 pp.
- Curtis BA. 1985. Activity of the Namib Desert dune ant, *Camponotus detritus*. *South African Journal of Zoology* **20**: 41-48.
- Curtis BA. 1985. The dietary spectrum of the Namib Desert dune ant *Camponotus detritus*. *Insectes Sociaux (Paris)* **32**: 78-85.
- Curtis BA. 1985. Nests of the Namib Desert dune ant *Camponotus detritus* Emery. *Insectes Sociaux (Paris)* **32**: 313-320.
- Curtis BA. 1985. Observations on the natural history and behaviour of the dune ant, *Camponotus detritus* Emery, in the central Namib Desert. *Madoqua* **14**: 279-289.
- Curtis BA. 1985. Temperature tolerances in the Namib Desert dune ant, *Camponotus detritus*. *Journal of Insect Physiology* **31**: 463-466.

- Curtis BA. 1988. Do ant-mimicking *Cosmophasis* spiders prey on their *Camponotus* hosts? *Cimbebasia* **10**: 67-70.
- Curtis BA. 1990. Behaviour and ecophysiology of the Namib dune ant, *Camponotus detritus* (Hymenoptera: Formicidae). In: *Namib Ecology 25 years of Namib research*. Seely MK (Editor) Transvaal Museum, Pretoria: 129-133.
- Curtis BA, Seely MK. 1987. Effect of an environmental gradient upon the distribution and abundance of the dune ant, *Camponotus detritus*, in the central Namib Desert. *Journal of Arid Environments* **13**: 259-266.
- Dallas HF, Curtis BA. 1991. Shell distribution of the terrestrial snail, *Trigonephrus* sp. (Mollusca: Dorcasiidae) in the southern Namib dunes. *Cimbebasia* **13**: 105-115.
- Dallas HF, Curtis BA, Ward D. 1991. Water exchange, temperature tolerance, oxygen consumption and activity of the Namib Desert snail, *Trigonephrus* sp. *Journal of Molluscan Studies* **57**: 359-366.
- Grohmann C, Oldeland J, Stoyan D, Linsenmair KE. 2010. Multi-scale pattern analysis of a mound-building termite species. *Insect. Soc.* **57**: 477-486.
- Grube S. 1994. Unsichtbar, aber effizient: Termiten in der Namibwüste. *Namibia Magazin*: 12-13.
- Grube S, Rudolph D. 1995. Termites in arid environments: the waterbalance of *Psammotermes allocerus* Silvestri. *Mitteilungen der Deutschen Gesellschaft für allgemeine und angewandte Entomologie* **10**: 665-668.
- Hadley NF. 1994. Ventilatory patterns and respiratory transpiration in adult terrestrial insects. *Physiological Zoology* **67**: 175-189.
- Hamilton WJ III. 1975. Coloration and its thermal consequences for diurnal desert insects. In: *Environmental physiology of desert organisms*. Hadley NF (Editor) Dowden, Hutchinson & Ross, Inc., Stroudsburg, Pennsylvania: 67-89.
- Holm E. 1970. *The influence of climate on the activity patterns and abundance of xerophilous Namib Desert dune insects*. MSc. University of Pretoria (Department of Entomology), Pretoria: 44 pp.
- Holm E, Edney EB. 1973. Daily activity of Namib Desert arthropods in relation to climate. *Ecology* **54**: 45-56.
- Holm E, Kirsten JF. 1979. Pre-adaptation and speed mimicry among Namib Desert scarabaeids with orange elytra. *Journal of Arid Environments* **2**: 263-272.
- Irwin ME. 2001. Species composition and seasonal flight periodicity of stiletto flies (Diptera: Therevidae) occurring along the Kuiseb River, Gobabeb, Namibia. *Cimbebasia* **17**: 169-17.
- Lighton JRB. 1990. Slow discontinuous ventilation in the Namib dune-sea ant *Camponotus detritus* (Hymenoptera, Formicidae). *Journal of experimental Biology* **151**: 71-82.
- Marsh AC. 1984. The efficacy of pitfall traps for determining the structure of a desert ant community. *Journal of the Entomological Society of Southern Africa* **47**: 115-120.
- Marsh AC. 1985. Microclimatic factors influencing foraging patterns and success of the thermophilic desert ant, *Ocymyrmex barbiger*. *Insectes Sociaux (Paris)* **32**: 286-296.
- Marsh AC. 1987. Thermal responses and temperature tolerance of a desert ant-lion larva. *Journal of Thermal Biology* **12**: 295-300.
- Marsh AC. 1988. Activity patterns of some Namib Desert ants. *Journal of Arid Environments* **14**: 61-74.
- Marsh AC. 1990. The biology and ecology of Namib Desert ants. In: *Namib ecology 25 years of Namib research*. Seely MK (Editor) Transvaal Museum, Pretoria: 109-114.
- Roer H. 1984. Zum Vorkommen und Beutefangverhalten des Sandlaufkäfers *Mantichora latipennis* Waterh. (Col.: Cicindelidae) in Südwestafrika/Namibia. *Journal of the South West Africa Scientific Society* **38**: 87-94.
- Rössl R. 1997. Ecology and development of *Hyomora falcilipes* (Curculionidae: Coleoptera). Arbeitskreis Wüstenökologie. Deutsche Gesellschaft für Ökologie, Leipzig: 1-6.
- Thibaud J-M, Massoud Z. 1988. Research on the aerial interstitial fauna of fine sand: *Collembola*. II - Namib Desert. *Annls. Soc. ent. Fr. (N.S.)* **24**: 211-214.
- Watson RT. 1986. Detritivores of the Namib Dunes: Thysanura - an autecological approach. *Proceedings: Structure and Function of sand dune ecosystems*. Van der Merwe D, McLachlan A, Hesp P (Editors) Institute for Coastal Research, Port Elizabeth: 60-63.
- Watson RT. 1987. Psammophilous Lepismatidae of the Namib Desert. *Namib Bulletin*, Gobabeb: 7-8.

- Watson RT. 1989. Niche separation in Namib Desert dune Lepismatidae (Thysanura: Insecta): detritivores in an allochthonous detritus ecosystem. *Journal of Arid Environments* **17**: 37-48.
- Watson RT, Anelich R, Schutte AL. 1990. Fungi in the gut contents of Namib Desert dune Lepismatidae (Thysanura: Insecta). *Madoqua* **17**: 53-54.
- Watson RT, Irish J. 1988. An introduction to the Lepismatidae (Thysanura: Insecta) of the Namib Desert sand dunes. *Madoqua* **15**: 285-293.
- Wehner R. 1987. Spatial organization of foraging behavior in individually searching desert ants, *Cataglyphis* (Sahara Desert) and *Ocymyrmex* (Namib Desert). In: *Behavior in Social Insects*. Pasteels JM, Deneubourg J-L (Editors) Birkhäuser Verlag, Basel/Boston: 15-42.
- Weibel D. 2004. *Foraging ecology of the Namibian desert ant Ocymyrmex robustior in the Kuiseb River*. MSc. University of Zürich, Zürich: 79 pp.
- Zeidler J. 1995. *Biology of ticks in the Kuiseb region (Namibia) with emphasis on chronobiological aspects*. MSc. Johann Wolfgang Goethe Universität, Frankfurt/Main: 55 pp.
- Zeidler J. 1997. *Distribution of termites (Isoptera) throughout Namibia - environmental connections*. MSc. University of the Witwatersrand, Johannesburg: 91 pp.

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- Bartholomew GA, Lighton JRB, Louw GN. 1985. Energetics of locomotion and patterns of respiration in tenebrionid beetles from the Namib Desert. *Journal of Comparative Physiology, B* **155**: 155-162.
- Cloudsley-Thompson JL. 1965. On the function of the sub-elytral cavity in desert tenebrionidae (Col.). *Entomologist's Monthly Magazine* **100**: 148-151.
- Cloudsley-Thompson JL. 1990. Thermal ecology and behaviour of *Physadesmia globosa* (Coleoptera: Tenebrionidae) in the Namib Desert. *Journal of Arid Environments* **19**: 317-324.
- Cloudsley-Thompson JL. 2001. Thermal and water relations of desert beetles. *Naturwissenschaften* **88**: 447-460.
- Coineau Y, Lancaster N, Prodon R, Seely MK. 1982. Burrowing habits and substrate selection in ultrapsammophilous tenebrionid beetles of the Namib Desert. *Vie Milieu* **32**: 125-131.
- Cooper PD. 1982. Water balance and osmoregulation in a free-ranging tenebrionid beetle, *Onymacris unguicularis*, of the Namib Desert. *Journal of Insect Physiology* **28**: 737-742.
- Coutchié PA, Crowe JH. 1979. Transport of water vapor by tenebrionid beetles I: kinetics. *Physiological Zoology* **52**: 67-87.
- Coutchié PA, Crowe JH. 1979. Transport of water vapor by tenebrionid beetles. II. regulation of the osmolarity and composition of the hemolymph. *Physiological Zoology* **52**: 88-100.
- Crawford CS. 1988. Nutrition and habitat selection in desert detritivores. *Journal of Arid Environments* **14**: 111-122.
- Crawford CS, Hanrahan SA, Seely MK. 1990. Scale-related habitat use by *Physadesmia globosa* (Coleoptera: Tenebrionidae) in a riparian desert environment. In: *Namib ecology 25 years of Namib research*. Seely MK (Editor) Transvaal Museum, Pretoria: 135-142.
- Crawford CS, Seely MK. 1993. Dunefield detritus: its potential for limiting population size in *Lepidochora discoidalis* (Gebien) (Coleoptera: Tenebrionidae) in the Namib Desert. *Journal of African Zoology* **107**: 527-533.
- Crawford CS, Taylor EC. 1984. Decomposition in arid environments: role of the detritivore gut. *South African Journal of Science* **80**: 170-176.
- Curtis BA, McClain E, Seely MK. 1983. Effects of wind on surface activity of Namib Desert insects (abstract). *Proceedings: Fourth Entomological Congress*. Entomological Society of South Africa (ESSA), Johannesburg: 55.
- Curtis BA, Seely MK. 1980. Tenebrionid research. *Namib Bulletin*, Gobabeb: 8.
- De Villiers PS. 1984. *Aspects of the reproductive behaviour of the Namib tenebrionid beetle, Onymacris unguicularis (Haag)*. PhD. University of the Witwatersrand, Faculty of Science, Johannesburg: 185 pp.
- De Villiers PS, Hanrahan SA. 1991. Sperm competition in the Namib Desert beetle, *Onymacris unguicularis*. *Journal of Insect Physiology* **37**: 1-8.
- Edney EB. 1971. The body temperature of tenebrionid beetles in the Namib Desert of southern Africa. *Journal of Experimental Biology* **55**: 253-272.

- Edney EB. 1971. Some aspects of water balance in tenebrionid beetles and a thysanuran from the Namib Desert of southern Africa. *Physiological Zoology* **44**: 61-76.
- Enders MM. 1995. Size-assortative mating in a tenebrionid beetle of the Namib Desert. *Journal of Arid Environments* **29**: 469-484.
- Enders MM, Schüle H. 1993. Age identification of a Namib Desert tenebrionid beetle. *Journal of Arid Environments* **24**: 211-214.
- Enders MM, Schüle H, Henschel JR. 1998. Sexual dimorphism, fighting success and mating tactics of male *Onymacris plana* Péringuey (Coleoptera: Tenebrionidae) in the Namib Desert. *Ethology* **104**: 1003-1019.
- Endrödy-Younga S. 1982. Dispersion and translocation of dune specialist tenebrionids in the Namib area. *Cimbebasia Series A* **5**: 257-271.
- Ferguson JWH. 1989. Summer activity patterns of the riparian desert beetle *Physadesmia globosa*. *Madoqua* **16**: 9-13.
- Ferguson JWH. 1992. Mate following in desert tenebrionid beetles revisited: why do males spend so much time in courtship? *Journal of the Kansas Entomological Society* **65**: 125-133.
- Gäde G. 1994. Isolation and structure elucidation of a neuropeptide from three species of Namib desert tenebrionid beetles. *South African Journal of Zoology* **29**: 11-18.
- Gerneke D, McClain L. 1981. SEM study of wax blooms in tenebrionid beetles from the Namib Desert. *Electron Microscopy* **2**: 101-102.
- Glajchen DM. 1984. Temperature measurement in biotelemetry - a novel application for microwave dielectric resonators. *Elektron, Johannesburg*: 10-13.
- Goelst K, Seely MK, Mitchell D. 1993. Temperature dependence of metabolic rates of five species of Namib desert beetle (abstract). *Proceedings: Thermal physiology*. Milton AS (Editor) International Union of Physiological Sciences Thermal Physiology Commission, Aberdeen: 35.
- Hadley NF. 1993. Beetles make their own waxy sunblock. *Natural History*: 44-45.
- Hadley NF, Louw GN. 1980. Cuticular hydrocarbons and evaporative water loss in two tenebrionid beetles from the Namib Desert. *South African Journal of Science* **76**: 298-301.
- Hamilton WJ III. 1971. Competition and thermoregulatory behavior of the Namib Desert tenebrionid beetle genus *Cardiosis*. *Ecology* **52**: 810-822.
- Hamilton WJ III, Buskirk RE, Buskirk WH. 1976. Social organization of the Namib Desert tenebrionid beetle *Onymacris rugatipennis*. *The Canadian Entomologist* **108**: 305-316.
- Hamilton WJ III, Henschel JR, Seely MK. 2003. Fog collection by Namib Desert beetles. *South African Journal of Science* **99**(3/4): 181.
- Hamilton WJ III, Seely MK. 1976. Fog basking by the Namib Desert beetle, *Onymacris unguicularis*. *Nature* **262**: 284-285.
- Hamilton WJ III, Seely MK. 1976. Fog trap construction and fog basking by Namib Desert tenebrionid beetles. *Bulletin of the Ecological Society of America* **57**(1): 57.
- Hanrahan SA. 1983. Observations on cell division in midgut regions of *Onymacris plana* (Coleoptera: Tenebrionidae) in relation to feeding and temperature (abstract). *Proceedings: Fourth Congress of the Entomological Society of Southern Africa, Johannesburg*: 54-55.
- Hanrahan SA, Chemaly G, McClain E. 1983. Preliminary report on changes in elytron structure of tenebrionid beetles as a result of ageing. *Proceedings: Electron Microscopy Society of Southern Africa*: 1-2.
- Hanrahan SA, Kirchner WH. 1994. Acoustic orientation and communication in desert tenebrionid beetles in sand dunes. *Ethology* **97**: 26-32.
- Hanrahan SA, Kirchner WH. 1997. The effect of wind on foraging activity of the tenebrionid beetle *Lepidochora discoidalis* in the sand dunes of the Namib Desert. *South African Journal of Zoology* **32**: 136-139.
- Hanrahan SA, McClain E, Gernecke D. 1984. Dermal glands concerned with production of wax blooms in desert tenebrionid beetles. *South African Journal of Science* **80**: 176-181.
- Hanrahan SA, McClain E, Warner SJC. 1987. Protein component of the surface 'wax' bloom of a desert tenebrionid, *Zophosis testudinaria*. *South African Journal of Science* **83**: 495-497.

- Hanrahan SA, Nicolson SW. 1987. Ultrastructure of the malpighian tubules of *Onymacris plana plana* Péringuey (Coleoptera: Tenebrionidae). *International Journal of Insect Morphology and Embryology* **16**: 99-119.
- Hanrahan SA, Seely MK. 1990. Food and habitat use by three tenebrionid beetles (Coleoptera) in a riparian desert environment. In: *Namib ecology 25 years of Namib research*. Seely MK (Editor) Transvaal Museum, Pretoria: 143-147.
- Hattingh J. 1984. Body fluid composition in dehydrated and hydrated fog baskers and trench diggers (Coleoptera: Tenebrionidae). *South African Journal of Science* **80**: 191.
- Hattingh J, Ganhao M, Naidu SG. 1984. Haemolymph composition in Namib Desert tenebrionid beetles. *Comparative Biochemistry and Physiology* **78 A**: 541-545.
- Hauffe HC. 1989. Speciation in *Onymacris rugatipennis*, an adesmiine tenebrionid from the central Namib Desert - a multiple approach. Honours. Oxford University, Oxford: 88 pp.
- Hauffe HC, Pietruszka RD, Seely MK. 1988. Observations on the behaviour of *Onymacris laeviceps* Gebien (Coleoptera: Tenebrionidae : Adesmiini) in the central Namib Desert dunes. *The Journal of the Entomological Society of Southern Africa* **51**: 183-192.
- Hauffe HC, Searle JB, Seely MK. 1994. The taxonomic status of two morphotypes of the tenebrionid *Onymacris rugatipennis*: indications from behavioural and genetical studies. *Journal of Zoology, London* **233**: 193-201.
- Hauffe HC, Seely MK. 1995. The taxonomic status of two morphotypes of the tenebrionid *Onymacris rugatipennis* (Haag): indications from morphological, geographical and physiological studies. *Cimbebasia* **14**: 85-97.
- Henschel JR, Seely MK. 1999. Mass-length relationships of Namib tenebrionids. *Madoqua* **19**: 159-160.
- Henwood K. 1974. I. A field tested thermoregulation model for two diurnal desert tenebrionid beetles. II. Infrared reflectivity as an alternative thermal strategy to colour change. PhD. University of California, Davis: 60 pp.
- Henwood K. 1975. A field-tested thermoregulation model for two diurnal Namib Desert tenebrionid beetles. *Ecology* **56**(6): 1329-1342.
- Henwood K. 1975. Infrared transmittance as an alternative thermal strategy in the desert beetle *Onymacris plana*. *Science* **189**: 993-994.
- Isaacson L, Nicolson S. 1989. A reappraisal of the oil-gap technique for the measurement of transtubular potentials in insect epithelia. *Journal of Experimental Biology* **141**: 429-440.
- Isaacson LC, Nicolson SW, Fisher DW. 1989. Electrophysiological and cable parameters of perfused beetle Malpighian tubules. *American Journal of Physiology* **257**: R1190-R1198.
- Kühnelt G. 1969. On the biology and temperature accommodation of *Lepidochora argentogrisea* Koch (Col. Tenebrionidae). *Scientific Papers of the Namib Desert Research Station*: 121-128.
- Lighton JRB. 1991. Ventilation in Namib Desert tenebrionid beetles: mass scaling and evidence of a novel quantized flutter-phase. *Journal of Experimental Biology* **159**: 249-268.
- Lockey KH. 1982. Hydrocarbons of adult *Onymacris plana* (Péringuey) and *Onymacris rugatipennis* (Haag) (Coleoptera: Tenebrionidae). *Insect Biochemistry* **12**: 69-81.
- Lockey KH. 1982. Hydrocarbons of adult *Physadesmia globosa* (Haag) and *Stenocara gracilipes* (Haag) (Coleoptera: Tenebrionidae). *Insect Biochemistry* **12**: 331-342.
- Lockey KH. 1984. Hydrocarbons of adult *Zophosis (Gyrosis)* species and *Zophosis (Onychosis) gracilipes* (Deyrolle) (Coleoptera: Tenebrionidae). *Journal of Insect Biochemistry* **14**: 645-656.
- Lockey KH. 1984. Hydrocarbons of *Metriopus depressus* (Haag) and *Renatiella scrobipennis* (Haag) (Coleoptera: Tenebrionidae). *Insect Biochemistry* **14**(1): 65-75.
- Lockey KH. 1985. Cuticular hydrocarbons of adult *Eurychora* sp. (Coleoptera: Tenebrionidae). *Comparative Biochemistry and Physiology* **81B**: 223-227.
- Lockey KH. 1985. Cuticular hydrocarbons of adult *Lepidochora discoidalis* Gebien and *Lepidochora eberlanzi* Koch (Coleoptera: Tenebrionidae). *Comparative Biochemistry and Physiology* **80B**: 633-640.
- Lockey KH. 1992. Insect hydrocarbon chemotaxonomy: cuticle hydrocarbons of adult and larval *Epiphysa* species Blanchard and adult *Onymacris unguicularis* (Haag) (Tenebrionidae: Coleoptera). *Comparative Biochemistry and Physiology* **102B**: 451-470.

- Louw GN, Hamilton WJ.III. 1972. Physiological and behavioural ecology of the ultrapsammophilous Namib Desert tenebrionid, *Lepidochora argentogrisea*. *Madoqua Series II* **1**(58): 87-95.
- Louw GN, Nicolson SW, Seely MK. 1986. Respiration beneath desert sand: carbon dioxide diffusion and respiratory patterns in a tenebrionid beetle. *Journal of Experimental Biology* **120**: 443-447.
- Louw GN, Seely MK. 1984. Labelled water in desert survival patterns. *Nuclear Active*: 11-14.
- Machin J, O'Donnell MJ. 1991. Rectal complex ion activities and electrochemical gradients in larvae of the desert beetle, *Onymacris*: comparisons with *Tenebrio*. *Journal of Insect Physiology* **37**: 829-838.
- Marcuzzi G, Lafisca MT. 1977. The digestive enzymes of some psammophilous tenebrionid beetles from South West Africa. *Madoqua* **10**: 191-193.
- Marden JH. 1987. In pursuit of females: following and contest behavior by males of a Namib Desert tenebrionid beetle, *Physadesmia globosa*. *Ethology* **75**: 15-24.
- McClain E. 1984. Wax blooms of Namib Desert tenebrionids. *Namib und Meer* **10**: 7-18.
- McClain E, Gerneke D. 1990. Morphology of wax blooms on selected Namib desert beetles (Coleoptera: Tenebrionidae). In: *Namib Ecology 25 years of Namib research*. Seely MK (Editor) Transvaal Museum, Pretoria: 193-202.
- McClain E, Hanrahan SA, Gerneke D. 1986. Extracuticular secretion on a Namib Desert tenebrionid, *Onymacris plana*: an indicator of aridity. *Madoqua* **14**: 363-367.
- McClain E, Kok CJ, Monard LAG. 1991. Reflective wax blooms on black Namib Desert beetles enhance day activity. *Naturwissenschaften* **78**: 40-42.
- McClain E, Magnuson P, Warner SJ. 1988. Behavioural fever in a Namib Desert tenebrionid beetle, *Onymacris plana*. *Journal of Insect Physiology* **34**: 279-284.
- McClain E, Praetorius RL, Hanrahan SA, Seely MK. 1984. Dynamics of the wax bloom of a seasonal Namib Desert tenebrionid, *Cauricara phalangium* (Coleoptera: Adesmiini). *Oecologia* (Berlin) **63**: 314-319.
- McClain E, Savage MJ, Nott K. 1984. Reflectivity of the cuticle of a Namib Desert tenebrionid, *Cauricara phalangium*, with a wax bloom. *South African Journal of Science* **80**: 183-184.
- McClain E, Seely MK, Hadley NF, Gray V. 1985. Wax blooms in tenebrionid beetles of the Namib Desert: correlations with environment. *Ecology* **66**: 112-119.
- Naidu SG. 1992. *Osmoregulation in tenebrionid beetles endemic to the Namib Desert*. PhD. University of Witwatersrand, Johannesburg: 215 pp.
- Naidu SG, Hattingh J. 1985. Osmoregulation in some Namib Desert tenebrionid beetles (abstract). *South African Journal of Science* **81**: 397.
- Naidu SG, Hattingh J. 1986. Water balance and osmoregulation in *Stips stali*, a nocturnal tenebrionid beetle from the Namib Desert. *Journal of Insect Physiology* **32**: 891-896.
- Naidu SG, Hattingh J. 1988. Water balance and osmoregulation in *Physadesmia globosa*, a diurnal tenebrionid beetle from the Namib Desert. *Journal of Insect Physiology* **34**: 911-917.
- Ndumba KP. 2004. Diversity of tenebrionid beetles in areas with different land use. Gobabeb Training and Research Centre (In-house training report) and Polytechnic of Namibia, Windhoek: 22 pp.
- Nicolson S, Isaacson L. 1990. Patch clamp of the basal membrane of beetle Malpighian tubules: direct demonstration of potassium channels. *Journal of Insect Physiology* **36**: 877-884.
- Nicolson S, Isaacson L, Gerneke D. 1991. A new method of preparing the basal membrane of renal tubules for patch clamp, using beetle malpighian tubules. *European Journal of Physiology* **417**: 654-656.
- Nicolson SW. 1980. Water balance and osmoregulation in *Onymacris plana*, a tenebrionid beetle from the Namib Desert. *Journal of Insect Physiology* **26**: 315-320.
- Nicolson SW. 1990. Water relations of the Namib tenebrionid beetles. In: *Namib ecology 25 years of Namib research*. Seely MK (Editor) Transvaal Museum, Pretoria: 173-178.
- Nicolson SW. 1991. Diuresis or clearance: is there a physiological role for the «diuretic hormone» of the desert beetle *Onymacris*? *Journal of Insect Physiology* **37**: 447-452.
- Nicolson SW. 1992. Diuresis in the desert? unexpected excretory physiology of a Namib beetle. *South African Journal of Science* **88**: 243-245.
- Nicolson SW, Bartholomew GA, Seely MK. 1984. Ecological correlates of locomotion speed, morphometrics and body temperature in three Namib Desert tenebrionid beetles. *South African Journal of Zoology* **19**: 131-134.

- Nicolson SW, Hanrahan SA. 1986. Diuresis in a desert beetle? hormonal control of the Malpighian tubules of *Onymacris plana* (Coleoptera: Tenebrionidae). *Journal of Comparative Physiology B* **156**: 407-413.
- Nicolson SW, Isaacson LC. 1987. Transepithelial and intracellular potentials in isolated Malpighian tubules of tenebrionid beetles. *American Journal of Physiology* **252**: 645-653.
- Nicolson SW, Louw GN, Edney EB. 1984. Use of a ventilated capsule and tritiated water to measure evaporative water losses in a tenebrionid beetle. *Journal of Experimental Biology* **108**: 477-481.
- Norgaard T, Dacke M. 2010. Fog-basking behaviour and water collection efficiency in Namib Desert darkling beetles. *Frontiers in Zoology* **7**: 1-8.
- Osberg DC, Hanrahan SA, Seely MK. 1986. Laboratory studies on hybridization among Namib Desert tenebrionids (Coleoptera: Tenebrionidae). *Madoqua* **14**: 345-354.
- Polis GA, Barnes JD, Seely MK, Henschel JR, Enders MM. 1998. Predation as a major cost of reproduction in Namib Desert tenebrionid beetles. *Ecology* **79**: 2560-2566.
- Rasmussen JL, Seely MK, Pietruszka RD. 1991. The reproductive behavior of six species of Namib Desert tenebrionid beetles (Coleoptera: Tenebrionidae). *Journal of Insect Behavior* **4**: 567-582.
- Roberts C. 1987. Thermal ecology of the desert beetles. *Namib Bulletin, Gobabeb*: 13-14.
- Roberts CS. 1991. *The surface and subsurface environments and the physiological and behavioural ecology of dune-living beetles in the Namib Desert*. MSc. University of the Witwatersrand, Johannesburg: 122 pp.
- Roberts C, Mitchell D, Seely M. 1993. Running cools a desert beetle (abstract). *Proceedings: International Union of Physiological Sciences*. Thermal Physiology Commission, Milton AS (Editor) Aberdeen: 109.
- Roberts CS, Seely MK, Ward D, Mitchell D, Campbell JD. 1991. Body temperatures of Namib Desert tenebrionid beetles: their relationship in laboratory and field. *Physiological Entomology* **16**: 463-475.
- Roer H. 1971. Zum Migrationsverhalten von *Onymacris plana* und *rugatipennis* (Col.: Tenebrionidae) in der Namibwüste/SWA. *Mitteilungen der Deutschen Entomologischen Gesellschaft* **30**: 32.
- Roer H. 1975. Zur Lebensweise des Namibwüstenkäfers *Onymacris plana* Peringuey (Col., Tenebrionidae, Adesmiini) unter besonderer Berücksichtigung seines Migrationsverhaltens. *Bonner Zoologische Beiträge* **26**: 239-256.
- Roer H. 1977. Areas and adaptation of the Namib Desert beetle *Onymacris r. rugatipennis* (Haag, 1875) (Col.: Tenebrionidae, Adesmiini) to the Kuiseb river bed in Southwest-Africa. *Zoologische Jahrbücher, Abteilung für Systematic, Ökologie und Geographie der Tiere* **104**: 560-576.
- Roer H. 1981. Weitere Untersuchungen zur Anpassung des Namibwüstenkäfers *Onymacris r. rugatipennis* (Haag 1875, Col.: Tenebrionidae, Adesmiini) an das Trockenflußbett des Kuiseb in Südwestafrika. *Mitteilungen der Deutschen Gesellschaft zur Allgemeinen Angewandten Entomologie* **3**: 218-222.
- Roer H. 1983. Aktionsraum und Anpassungsphänomene des Dünenkäfers *Onymacris laeviceps* Gebien (Col.: Tenebrionidae, Adesmiini) in der Namibwüste. *Bonner Zoologische Beiträge* **34**: 357-369.
- Roer H. 1985. Dispersion dynamics of tenebrionids of the genus *Onymacris* (Col.: Tenebrionidae, Adesmiini) in the Namib Desert. *Journal of the South West Africa Scientific Society* **39**: 65-70.
- Roer H. 1986. Zur Anpassung des Schwarzkäfers *Onymacris unguicularis* (Haag) (Col.: Tenebrionidae, Adesmiini) an die Nebelzone der Namibwüste. *Bonner Zoologische Beiträge* **37**: 143-154.
- Roer H. 1989. Zur Biologie der Namibwüstenkäfer *Onymacris hottentota* (Peringuey) und *O. lobicollis* (Fairmaire) (Col.: Tenebrionidae, Adesmiini). *Proceedings: Verhandlungen der Westdeutschen Entomologischen Tagung*, Düsseldorf: 43-54.
- Rössl R. 1998. Ökologie von Tenebrioniden (Coleoptera) der Namib. *Proceedings: Mechanismen der Aufrechterhaltung tropischer Diversität Tropenökologie*. Dalitz H (Editor) DFG Abschlußsymposium. Deutsche Gesellschaft für Tropenökologie Bielefeld, Germany: 12.
- Rössl R. 2000. *Reproduktionsbiologie, Entwicklungsbiologie und Ökologie von sympatrischen Tenebrionidae (Coleoptera: Insecta) des Kuiseb bei Gobabeb in der Namib Wüste / Namibia*. PhD. Rheinischen Friedrich-Wilhelms-Universität, Bonn: 370 pp.
- Rössl R. 2005. Factors influencing egg laying behaviour and triggering ovulation in desert Tenebrionidae (Coleoptera: Insecta). *Mitteilungen der Deutschen Gesellschaft für angewandte Entomologie* **P11-05**: 1-3.

- Rössl R. 2006. Faktoren, die das Eiablageverhalten und die Ovulation Wüsten bewohnender Tenebrioniden (Coleoptera: Insecta) beeinflussen. *Mitteilungen der deutschen Gesellschaft für angewandte Entomologie* **15**: 421-423.
- Schüle H. 1990. Does sexual selection play a role in male fighting in *Onymacris*? *Namib Bulletin*, Gobabeb: 3.
- Schulze L. 1962. The Tenebrionidae of southern Africa 33. Descriptive notes on the early stages of *Onymacris rugatipennis* Haag and *Lepidochora discoidalis* Gebien and keys to genera and species of *Adesmiini* and *Eurychorini*. *Scientific Papers of the Namib Desert Research Station*: 161-180.
- Schulze L. 1962. The Tenebrionidae of southern Africa. 33. Description of the larvae of *Gonopus tibialis* Fabricius and *Gonopus agrestis* Fahraeus (*Gonopina*, sensu Koch 1956). *Scientific Papers of the Namib Desert Research Station*: 1-12.
- Schulze L. 1963. The Tenebrionidae of southern Africa 38. On the morphology of the larvae of some Stizopina (Coleoptera: Opatrini). *Scientific Papers of the Namib Desert Research Station*: 1-23.
- Schulze L. 1966. The Tenebrionidae of southern Africa 39. A revised key to the larvae of *Onymacris* Allard (Coleoptera: Adesmiini). *Scientific Papers of the Namib Desert Research Station*: 1-7.
- Schulze L. 1969. The Tenebrionidae of southern Africa part 42: Description of the early stages of *Carchares macer* Pascoe and *Herpiscius someri* Solier with a discussion of some phylogenetic aspects arising from the incongruities of adult and larval systematics. *Scientific Papers of the Namib Desert Research Station*: 139-149.
- Seely MK. 1973. Factors controlling reproduction of certain Namib Desert tenebrionids. *Madoqua Series II* **2**: 63-65
- Seely MK. 1979. Irregular fog as a water source for desert dune beetles. *Oecologia (Berl.)* **42**: 213-227.
- Seely MK. 1983. Effective use of the desert dune environment as illustrated by the Namib tenebrionids. *Proceedings: VIII. Intl. Colloquium of Soil Zoology*. Lebrun Ph, André HM, de Medts A, Grégoire-Wibo C, Wauthy G (Editors) Dieu-Brichart, Louvain-la-Neuve (Belgium): 357-368.
- Seely MK. 1989. Desert invertebrate physiological ecology: is anything special? *South African Journal of Science* **85**: 266-270.
- Seely MK, Hamilton WJ III 1976. Fog catchment sand trenches constructed by tenebrionid beetles, *Lepidochora*, from the Namib Desert. *Science* **193**: 484-486.
- Seely M, Henschel JR, Hamilton WJ III. 2005. Long-term data show behavioural fog collection adaptations determine Namib Desert beetle abundance. *South African Journal of Science* **101**: 570-572.
- Seely MK, Lewis CJ, O'Brien KA, Suttle AE. 1983. Fog response of tenebrionid beetles in the Namib Desert. *Journal of Arid Environments* **6**: 135-143.
- Seely MK, Roberts CS, Mitchell D. 1988. High body temperatures of Namib dune tenebrionids - why? *Journal of Arid Environments* **14**: 135-143.
- Turner JS, Lombard AT. 1990. Body colour and body temperature in white and black Namib desert beetles. *Journal of Arid Environments* **19**: 303-315.
- Ward D. 1991. A test of the 'maxithermy' hypothesis with three species of tenebrionid beetles. *Journal of Arid Environments* **21**: 331-336.
- Ward D, Seely MK. 1996. Adaptation and constraint in the evolution of the physiology and behavior of the Namib Desert tenebrionid beetle genus *Onymacris*. *Evolution* **50**: 1231-1240.
- Ward D, Seely MK. 1996. Behavioral thermoregulation of six Namib Desert tenebrionid beetle species (Coleoptera). *Behavior* **89**: 442-451
- Ward D, Seely MK. 1996. Competition and habitat selection in Namib desert tenebrionid beetles. *Evolutionary Ecology* **10**: 341-359.
- Wharton RA. 1980. Colouration and diurnal activity patterns in some Namib Desert Zophosini (Coleoptera: Tenebrionidae). *Journal of Arid Environments* **3**: 309-317.
- Wharton RA. 1983. Dispersal, diel periodicity, and longevity of *Stips stali* (Haag) (Coleoptera: Tenebrionidae). *The Coleopterists' Bulletin* **37**: 27-33.

Learning from the desert

- Burns R. 1999. Partnerships for experiential ecological education for sustainable development: a Namibian case study. In: *Education for sustainable development: getting it right*. Development Studies Network, Canberra: 159-164.
- Burns R. 2001. Educating scientists in context: a Namibian case study. *International Journal of Educational Development* **21**: 447-461.
- Seely MK, Henschel JR. 2003. Best practices in the world's oldest desert. In: *Conserving biodiversity in arid regions*. Lemons J, Victor R, Schaffer D (Editors) Kluwer Academic Publishers, Dordrecht: 119-128.
- Seely MK, Klintonberg P, Hamilton WJ. 2004. Solving environmental problems: Namibia. In: *Sharing innovative experiences*. Special Unit for South-South Cooperation United Nations Development Programme, New York: 87-95.
- Seely M, Klintonberg P, Henschel J. 2009. Learning from the desert. *Journal of Arid Land Studies* **19**: 1-3.
- Seely MK, Zeidler J, Henschel JR, Barnard P. 2003. Creative problem solving in support of biodiversity conservation. *Journal of Arid Environments* **54**(1): 155-164.
- Sguazzin T. 1995. Environmental education in an arid land - the Enviroteach Programme. *Splash* **11**: 10-12.
- Sguazzin T, du Toit D. 1995. *Wholly ground. Soil and soil erosion activities for Namibian learners*. An Enviroteach production. Desert Research Foundation of Namibia and Ministry of Education and Culture, Windhoek: 39 pp.
- Sguazzin T, Ward V, du Toit D. 1996. *A traveller's guide to environmental terms*. An Enviroteach production. Desert Research Foundation of Namibia and Ministry of Basic Education and Culture, Windhoek: 54 pp.

Natural history

- Anonymous. 1991. Die Welt der Namib-Wüste. *Naturwissenschaftliche Rundschau* **44**: 139-142.
- Anonymous. 1995. Die Spinne, die ihren Feinden davonrollt - ein Tier wird zum Rad. *P.M. (Peter Moosleitners interessantes Magazin)*, München/Germany: page 32.
- Anonymous. 2007. Natural wonders of the Namib a look at the quirkiest flora and fauna. *Sandpaper*. Windhoek: 16-18.
- Armstrong S. 1990. Fog, wind and heat: life in the Namib Desert. *New Scientist* **14**: 46-5.
- Bergerot S, Robert E. 1995. Where beetles dare. *Personality*: 42-47.
- Boss ES. 1974. Wonders of Africa's Namib Desert - recollections. *South West Africa Annual Yearbook*, Windhoek: 26-35.
- Cerutti H. 1998. Die Nebeltrinker. *Neue Zürcher Zeitung-FOLIO* (December 1998), Zürich, Switzerland: 66-67.
- Cerutti H. 1999. Auch Tiere haben das Rad erfunden. *Neue Zürcher Zeitung-FOLIO* (February 1999), Zürich, Switzerland: 56-57.
- Cerutti H. 1999. Die Nebelfänger von Gobabeb. *Neue Zürcher Zeitung-FOLIO* (13 January 1999), Zürich, Switzerland: 65.
- Cloudsley-Thompson JL. 1990. Dunes of the Namib. *Environmental Conservation* **17**: 70.
- Coineau Y. 1981. Une taupe qui 'nage' ... *Science et Vie* **770**: 75.
- Curtis B. 1990. Life in the dunes. *Flamingo* **2**(13), Johannesburg: 19-23.
- Fitzsimons V. 1961. Probing the mysteries of the Namib Desert. *C.S.I.R. Research Review* **11**: 111-112.
- Fitzsimons V. 1963. The Namib Desert. *African Wildlife* **17**: 215-227.
- Gilbertas B, Grünewald O. 2001. *Dans les sables vivants du Namib*. Grands Reportages (December 2001), Grenoble, France: 54-63.
- Günster A. 1994. A Namibian fairy story. *Getaway* (December 1994).
- Hamilton WJ.III. 1983. The living sands of the Namib. *National Geographic*, Washington, D.C.: 364-377.
- Hänel C. 1994. Hedgehog amongst beetles ... new Namib discovery. *Namib Times* (3 June 1994), Walvis Bay: 1.
- Hänel C. 1994. Signs of rain. *Flamingo*, Johannesburg: 24-29.
- Hänel C. 1995. Rivers of life. *Flamingo*, Johannesburg: 8-10.
- Hänel C. 1996. Footprints in the sand. *Flamingo*, Johannesburg: 24-31.
- Hartman A. 2006. Kuiseb River influences "dune travel". *Namib Times* (3 March 2006), Walvis Bay: 19.
- Hartman A. 2006. Experience the secret of the desert. *Namib Times* (2 May 2006), Walvis Bay: 8.

- Henschel JR. 1987. Sand-burrowing spiders: how do they do it? *Namib Bulletin*, Gobabeb: 11.
- Henschel JR. 1989. Arachnology in the Namib. *Namib Bulletin*, Gobabeb: 3-4.
- Henschel JR. 1989. Of spoons and spiders. *Namib Bulletin*, Gobabeb: 12-13.
- Henschel JR. 1989. A question of webs. *The Spider Club News*, Parkhurst, South Africa: 12-13.
- Henschel JR. 1990. Desert spider silk rivals fine crochet-work. *Namib Bulletin*, Gobabeb: 2.
- Henschel J. 1991. A closer look at spiders. *Roan News*, Windhoek: 16.
- Henschel J. 1991. The hot world of the spoor spider. *Flamingo*, Johannesburg: 41-47.
- Henschel JR. 1992. Dancers of the dunes. *Flamingo*, Johannesburg: 10-11.
- Henschel J. 1994. Pithy pits: population dynamics of Namib tenebrionid beetles. *Namib Bulletin*, Issue 11, Windhoek: 4-5.
- Henschel JR. 1995. Spider revolutions. *Natural History*: 36-39.
- Henschel J. 2000. Verbunden durch die !Nara. *Deutsch-Namibische Entwicklungsgesellschaft e.V. Jahresbericht 2000*: 8-9.
- Henschel J. 2008. Desert spiders and their kin - hidden but not forgotten. *Flamingo*, (July 2008), Venture Publishing, Windhoek: 22-25.
- Hoffmann H. 2008. Life in the dunes. *Flamingo*, (April 2008), Venture Publishing, Windhoek: 41-43.
- Hughes D, Hughes C. 1978. *Filming in the desert*. South West Africa Annual, Windhoek: 87.
- Hughes D, Hughes C. 1979. Spuren in der Todeszone. *GEO*. Verlag Gruner & Jahr AG, Hamburg: 106-108.
- Jacobson K. 1990. Interest in desert fungi 'mushrooms'. *Namib Bulletin*, Windhoek: 9.
- Jensen RAC. 1970. Across the waterless Namib dunes. *Geographical Magazine, London*: 728-732.
- Jonker C. 1991. Die Namib. *Prisma*, Cape Town: 43-45.
- Jonker C. 1991. Fossiel van die Namib. *Prisma*, Cape Town: 42-43.
- Koch C. 1967. Beetles from the Namib Desert. *African Wildlife* **21**: 305-312.
- Koch C. 1970. Living sands. *S.W.A. Annual*, Windhoek: 190-199.
- Lawrence RF. 1981. Duel in the desert. *South West African Annual Yearbook*, Windhoek: 29-34.
- Marsh AC. 1982. The ants of the Namib Desert. *Namib Bulletin*, Gobabeb: 7-8.
- Marsh AC. 1993. Ants that are not too hot to trot. *Natural History* **102**: 43-44.
- Nel M. 1995. Rare and interesting plants of the Namib Desert. *Veld and Flora* **81**: 14-15.
- Papageorge AC. 1963. The Namib Desert: time in suspension. *Scientiae* **4**: 1-5.
- Papageorge AC. 1963. Where time stands still. *Farmers Weekly*: 26-29.
- Pfeifer EH. 1979. Inara & Topnaar hottentots. *South West African Annual* **19**: 158-159.
- Poliwoda S. 2002. Wo die Ladys tanzen. *Süd-Deutsche Zeitung* (1 September 2002), Frankfurt: 1-2.
- Robinson MD. 1978. Desert denizen *Aporosaura anchietae*. *Scientific Progress* **11**: 3.
- Robinson MD. 1993. Death and dancing on the sun-baked dunes of Namibia. *Natural History* **102**: 28-30.
- Ross ES. 1972. The ancient Namib Desert. *Pacific Discovery* **25**: 2-13.
- Seely MK. 1973. Kuiseb River life sustaining barrier. *South West African Annual*: 153-157.
- Seely MK. 1976. The oldest coastal desert in the world? *South West African Annual*: 49.
- Seely MK. 1977. The fog-baskers of the Namib Desert. *Scientific Progress* **10**: 2.
- Seely MK. 1978. Fog consumers of the Namib Desert. *South West African Annual*: 58.
- Seely MK. 1979. The fog that makes a desert live. *Rössing Magazine*, Windhoek: 3-6.
- Seely MK. 1981. Desert plants use fog water. *Scientific Progress* **14**: 4.
- Seely MK. 1983. Unsung heroes of the desert: detritivores. *Rössing Magazine*, Windhoek: 1-5.
- Seely MK. 1987. Why beetles? *Namib Bulletin*, Gobabeb: 5-6.
- Seely M. 1994. What is normal rainfall in Namibia? *Flamingo*, Johannesburg: 17.
- Seely M. 1994. Wind, sand and Namibia's desert dunes. *Namibia Brief*, Windhoek: 60-63.
- Seely MK. 1999. *Wind, sand and Namib desert dunes. Brochure accompanying a collection of large format photographs*. Rembrandt van Rijn Art Foundation, South Africa.
- Seely M. 2007. *The lifeline of coastal Namibia. Conservation and the Environment in Namibia*. Venture Publishing, Windhoek: 44-45.
- Seely, M. 2007. Ten million years – one hundredth anniversary. *Conservation and the Environment in Namibia* **8**: 2-34.
- Seely, M, Roberts, C. 2008. Namibia's 'dry' rivers attract international attention. *Conservation and the Environment in Namibia* **9**: 4-7.
- Taylor S. 2004. Demystifying the desert. *The Big Issue* (March 2004), Windhoek: 24-26.

- Tilson R. 1981. A dry river in a thirsty land. *Rössing Magazine*, Windhoek: 7-11.
- Vergnani L. 2000. Tenebrionids, 'Inara', and the secret solitude of the Namib Desert. *The Chronicle of Higher Education* (May 26, 2000) 66(38): B2.
- Visser M. 1998. Nara fruit. *Flamingo*, Johannesburg: 9-13.
- Visser M, Retief K. 1998. Nara of the Namib. *Living Africa, Johannesburg*: 66-75.
- Ward JD, Seely MK. 1989. Namib dunes - patterns in space and time. *Rössing Magazine*, Windhoek: 6-11.
- Ward JD, Seely M. 1990. Dune sands, ocean currents and man: Namibia's dynamic coastline. *Rössing Magazine*, Windhoek: 12-17.

People and the desert

- Botelle A, Kowalski K. 1995. *Changing resource use in Namibia's lower Kuiseb River valley: perceptions from the Topnaar community*. Institute of Southern African Studies at the University of Lesotho and the Social Sciences Division at the University of Namibia, Desert Research Foundation of Namibia, Windhoek: 90 pp.
- Iwanek S. 2004. *Kulturell differente Property Rights Regime Namibias im Konflikt und Wandel: am Beispiel der Verfügungsrechte über Land und die natürliche Resource Inara durch die #Aonin*. Diploma, Johann Wolfgang Goethe-Universität, Frankfurt/Main: 1-136.
- Lawrence RF. 1969. V.F. FitzSimons, a biographical appreciation. *Scientific Papers of the Namib Desert Research Station*: 1-4.
- Marcuzzi G. 1970. In memoria di Carlo Koch. *Memorie della Societa Entomologica Italiana* **49**: 153-155.
- Meester W. 1980. Scientists remember Charles Koch (1904-1970). *South African Journal of Science* **76**: 396.
- Mitchell L. 1984. Zoologists and the desert. *South African Journal of Science* **80**: 160-162.
- Seely M. 2006. People and deserts. In: *Global desert outlook*, Ezcurra E (Editor) United Nations Environment Programme, Nairobi: 27-47.
- Van den Eynden V, Vernemmen P, Van Damme P. 1992. *Ethnobotanical survey of the Namib Desert*. Final report no. B7-5040/91/005 (01/10/1991-30/09/1992) Faculty Agricultural and Applied Biological Sciences, University of Gent, Gent: 293 pp.
- Van den Eynden V, Vernemmen P, Van Damme P. 1992. *The ethnobotany of the Topnaar*. Universiteit Gent, Gent. Belgium: 145 pp.
- Ward JD, van Wyk AJ. 1985. Topnaar (#Aonin) place names along the lower Kuiseb River, central Namib Desert. *Namib Bulletin*, Gobabeb: 3-8.
- Werner W. 2003. *Livelihoods among the Topnaar of the Lower Kuiseb*. Environmental Learning and Action in the Kuiseb (ELAK). Programme report. Desert Research Foundation of Namibia, Windhoek: 2-36 pp.
- Widlok T. 1996. *!Nara harvesting, a thing of the past?* Desert Ecological Research Unit, Gobabeb: 1-2. (Preliminary report)
- Widlok T. 1998. Unearthing culture Khoisan funerals and social change. *Anthropos* **93**: 115-126.
- Widlok T. 2004. !Nara property relations. In: *!NARA fruit for development of the !Khuiseb Topnaar*. Henschel J, Dausab R, Moser P, Pallett J (Editors). Namibia Scientific Society, Windhoek: 99-106.

Tourism

- Bridgeford P, Bridgeford M. 2009. *Touring Sesriem & Sossuvlei*. P. & M. Bridgeford. Namibia.
- DoT MET. 2011. Tourist Statistical Report 2010. Directorate of Tourism, Ministry of Environment & Tourism, Windhoek: 53 pp.
- Federation of Namibian Tourism Associations. 2010. Conservancy Based Tourism Enterprises (CBTEs) in Namibia and the Business of Tourism: A Private Sector Point of View. A ComMark Trust Study, FENATA, Windhoek: 180 pp.
- Namibia Economic Policy Research Unit. 2008. Preliminary domestic tourism survey findings. MET/NTB, Windhoek: 33 pp.
- Namis S. 2001. *Sossusvlei*. Out of Africa Publishers, Windhoek: 87 pp.
- Ministry of Environment & Tourism. 2008. Strategic Environmental Assessment (SEA) for the coastal areas of the Erongo and Kunene Regions. MET, Windhoek: 178 pp.

- Seely MK, Hamilton WJ.III. 1978. Durability of vehicle tracks on three Namib Desert substrates. *South African Journal of Wildlife Research* **8**: 107-111.
- SIAPAC. 2007. Study on characteristics of demand of tourists and use patterns of protected areas in Namibia. Ministry of Environment & Tourism, Windhoek: 154 pp.
- World Travel and Tourism Council. 2006. Tourism Satellite Account for the Republic of Namibia: The Impact of Travel and Tourism on Jobs and the Economy. WTTC, London: 64 pp.

Vegetation physiology and ecology

- Bate GC, Walker BH. 1993. Water relations of the vegetation along the Kuiseb River, Namibia. *Madoqua* **18**: 85-91.
- Berry C. 1991. Nara: unique melon of the desert. *Veld & Flora* **77**(1): 22-23.
- Berry C. 2003. Aspects of phenology and condition of inland and coastal !nara plants in the Namib-Naukluft Park, Namibia. *Dinteria* **28**: 1-18.
- Berry C. 2004. !Nara phenology and fruit production. In: *!NARA fruit for development of the !Khuseb Topnaar*. Henschel J, Dausab R, Moser P, Pallett J (Editors). Namibia Scientific Society, Windhoek: 63-68.
- Boyer DC. 1989. Some characteristics of the plant communities of three dunes situated across a climatic gradient in the Namib Desert. *Madoqua* **16**: 141-148.
- Boyer DC, Boyer HJ. 1989. The status of alien invasive plants in the major rivers of the Namib Naukluft Park. *Madoqua* **16**: 51-58.
- Burke A, Jürgens N, Seely MK. 1998. Floristic affinities of an inselberg archipelago in the southern Namib desert - relic of the past, centre of endemism or nothing special? *Journal of Biogeography* **25**: 311-317.
- Danin A. 1991. Plant adaptations in desert dunes. *Journal of Arid Environments* **21**: 193-212.
- Danin A, Orshan G. 1995. Circular arrangement of *Stipagrostis ciliata* clumps in the Negev, Israel and near Gobabeb, Namibia. *Journal of Arid Environments* **30**: 307-313.
- De Vos M. 1997. Narras, voedsel van die woestyn. *Veld & Flora* **83**(4): 118-119.
- De Winter B. 1990. Notes on African plants: Poaceae. two new species of *Stipagrostis* (Aristideae) from the dune-Namib Desert, Namibia. *Bothalia* **20**: 82-87.
- Dentlinger U. 1977. An ethnobotanical study of the !nara plant among the Topnaar hottentots of Namibia. *Munger Africana Library Notes* **38**: 3-39.
- Du Pisani E. 1983. Past and present plant utilization in Namaland and the lower Kuiseb River valley, South West Africa (Namibia) - a preliminary report. *Khoisis* **4**: 1-19.
- Eppley SM, Wenk EH. 2001. Reproductive biomass allocation in the dioecious perennial *Acanthosicyos horrida*. *South African Journal of Botany* **67**: 10-14.
- Giess W. 1962. Some notes on the vegetation of the Namib Desert with a list of plants collected in the area visited by the Carp-Transvaal Museum expedition during May 1959. *Cimbebasia* (2): 3-35.
- Gruntkowski N, Henschel J. 2004. !Nara in Topnaar history. In: *!NARA fruit for development of the !Khuseb Topnaar*. Henschel J, Dausab R, Moser P, Pallett J (Editors). Namibia Scientific Society, Windhoek: 39-48.
- Günster A. 1993. Does the timing and intensity of rain events affect resource allocation in serotinous desert plants? *Acta Oecologica* **14**: 153-159.
- Günster A. 1993. Dune plants. *Flamingo*, Johannesburg: 16-19.
- Günster A. 1993. Fairy circles. *Flamingo*, Johannesburg: 13-15.
- Günster A. 1993. Microhabitat differentiation among serotinous plants in the Namib desert. *Journal of Vegetation Science* **4**: 585-590.
- Günster A. 1993. *Seed bank dynamics of serotinous plants in the Central Namib*. PhD. Westfälischen Wilhelms-Universität Münster, Münster: 112 pp.
- Günster A. 1994. Phenological niches of coexisting serotinous plants in the Namib Desert. *Journal of Tropical Ecology* **10**: 531-544.
- Günster A. 1994. Seed bank dynamics - longevity, viability and predation of seeds of serotinous plants in the central Namib Desert. *Journal of Arid Environment* **28**: 195-205.
- Günster A. 1994. Variability in life history parameters of four serotinous plants in the Namib Desert. *Vegetatio* **114**: 149-160.

- Günster A. 1995. *Codon royenii* - a multiseasonal desert plant. *Cimbebasia* **14**: 23-30.
- Hachfeld B, Jürgens N. 2000. Climate patterns and their impact on the vegetation in a fog driven desert: the Central Namib Desert in Namibia. *Phytocoenologia* **30**: 567-589.
- Hebeler F. 2000. *Structural and ecophysiological shoot features of the leafless cucurbit Acanthosicyos horridus, a keystone endemic of the Namib desert*. Diploma, Justus-Liebig-Universität, Institut für Allgemeine Botanik und Pflanzenphysiologie, Gießen, Germany: 104 pp.
- Hebeler F, Botha C, van Bel A. 2004. Water, photosynthesis and transpiration of !nara. In: *!NARA fruit for development of the !Khuseb Topnaar*. Henschel J, Dausab R, Moser P, Pallett J (Editors) Namibia Scientific Society, Windhoek: 93-98.
- Henschel J, Dausab R, Moser P, Pallett J. 2004. (Editors). *!NARA fruit for development of the !Khuseb Topnaar*. Namibia Scientific Society, Windhoek: 168 pp.
- Henschel J, Dausab R, Moser P, Pallett J. 2004. *!Nara: culture, nature and nurture*. In: *!NARA fruit for development of the !Khuseb Topnaar*. Henschel J, Dausab R, Moser P, Pallett J (Editors) Namibia Scientific Society, Windhoek: 33-38.
- Henschel J, Dausab R, Moser P, Pallett J. 2004. NARA: which way forward? In: *!NARA fruit for development of the !Khuseb Topnaar*. Henschel J, Dausab R, Moser P, Pallett J (Editors). Namibia Scientific Society, Windhoek: 131-140.
- Henschel J, Henschel I, Moser P. 2004. Literature citations and bibliography on !Nara and Topnaar. In: *!NARA fruit for development of the !Khuseb Topnaar*. Henschel J, Dausab R, Moser P, Pallett J (Editors) Namibia Scientific Society, Windhoek: 141-157.
- Henschel J, Moser P. 2004. !Nara ecology - an introduction. In: *!NARA fruit for development of the !Khuseb Topnaar*. Henschel J, Dausab R, Moser P, Pallett J (Editors) Namibia Scientific Society, Windhoek: 55-61.
- Hesp PA. 1991. Ecological processes and plant adaptations on coastal dunes. *Journal of Arid Environments* **21**: 165-191.
- Hoffman MT, Cowling RM, Douie C, Pierce SM. 1989. Seed predation and germination of *Acacia erioloba* in the Kuiseb River Valley, Namib Desert. *South African Journal of Botany* **55**: 103-106.
- Ito M. 2005. Changes in the distribution of the !nara plant that affect the life of the Topnaar people in the lower Kuiseb River, Namib Desert. *African Study Monographs Suppl.* **30**: 65-75.
- Jacobson KM. 1992. *Factors affecting VA-mycorrhizal community structure in the Namib dune field; and the population biology of an ectomycorrhizal Basidiomycete: Suillus granulatus*. PhD, Virginia Polytechnic Institute, Virginia State University, Blacksburg USA.
- Jacobson KM. 1994. Fungi in the desert. *Namib Bulletin*, Windhoek: 9-12.
- Jacobson KM. 1996. Macrofungal ecology in the Namib Desert: a fruitful or futile study? *Mcllvainea Journal of American Amateur Mycology* **12**: 21-32.
- Jacobson KM. 1997. Moisture and substrate stability determine VA-mycorrhizal fungal community distribution and structure in an arid grassland. *Journal of Arid Environments* **35**: 59-75.
- Jacobson KM, Jacobson PJ, Miller OKJ. 1999. The autecology of *Battarrea stevenii* in ephemeral rivers of southwestern Africa. *Mycological Research* **103**: 9-17.
- Kartusch B, Kartusch R. 2008. Stem anatomy of *Acanthosicyos horridus* (Cucurbitaceae). *South African Journal of Botany* **74**: 647-650.
- Klopatek JM, Stock WD. 1994. Partitioning of nutrients in *Acanthosicyos horridus*, a keystone endemic species in the Namib Desert. *Journal of Arid Environments* **26**: 233-240.
- Louw GN, Seely MK. 1980. Exploitation of fog water by a perennial Namib dune grass, *Stipagrostis sabulicola*. *South African Journal of Science* **76**: 38-39.
- Louw GN, Seely MK, Gerneke D. 1990. *Photosynthesis, transpiration and stomatal morphology in the leafless, desert cucurbit, Acanthosicyos horrida*. Desert Ecological Research Unit, Gobabeb: 1-13.
- Makuti O. 2004. *Pod production of Acacia erioloba and Acacia albida at Gobabeb and Swartbank in the Kuiseb River*. Btech Diploma, Gobabeb Training and Research Centre and Polytechnic of Namibia, Windhoek: 24 pp.
- Mamili P. 2005. *Plant moisture stress and the water content of tree leaves at different times during the day in the Kuiseb River flood plain*. Gobabeb Training and Research Centre (In-house training report) and Polytechnic of Namibia, Windhoek: 1-11.

- Mayer C. 2000. *Bestäubungsökologie der Inara-melone (Acanthosicyos horrida, Cucurbitaceae)*. Diploma, Julius-Maximilian-Universität, Würzburg, Germany: 3-114.
- Mayer C. 2004. Pollination ecology of !nara. In: *!NARA fruit for development of the !Khuseb Topnaar*. Henschel J, Dausab R, Moser P, Pallett J (Editors) Namibia Scientific Society, Windhoek: 69-76.
- Mohr M. 1997. *Ökologische Untersuchungen entlang eines Transekts der Sandnamib*. Diploma, University of Bielefeld, Bielefeld: 80 pp.
- Moser P. 2001. *Root and shoot development of Acanthosicyos horridus seedlings in the Namib Desert*. MSc, Westfälische Wilhelms-Universität Institut für Landschaftsökologie, Münster, Germany: 58 pp.
- Moser P. 2004. Regeneration processes of *Faidherbia albida* and *Acacia erioloba* in the western ephemeral rivers of Namibia. *Proceedings: 5th Waternet / Warfsa, Global Water Partnership*, Windhoek: 146.
- Moser P. 2004. Root and shoot development of !nara seedlings. In: *!NARA fruit for development of the !Khuseb Topnaar*. Henschel J, Dausab R, Moser P, Pallett J (Editors) Namibia Scientific Society, Windhoek: 85-91.
- Moser P, Henschel J. 2004. !Nara use by people. In: *!NARA fruit for development of the !Khuseb Topnaar*. Henschel J, Dausab R, Moser P, Pallett J (Editors) Namibia Scientific Society, Windhoek: 49-53.
- Moser P, Makuti O, Henschel JR. 2004. Vegetation monitoring along the Kuiseb ephemeral river in the Namib Desert - a tool to assess environmental change. *Proceedings: 5th Waternet / Warfsa, Global Water Partnership*, Windhoek: 145.
- Moser PM. 2006. *Regeneration and utilization of Faidherbia albida and Acacia erioloba along ephemeral rivers of Namibia*. PhD, University of Bonn, Bonn: 122 pp.
- Muller A. 2010. *The dynamics of seed bank dispersal and deposition under natural environmental conditions in the central Namib and the southern Kalahari Deserts*. MSc, University of Namibia, Windhoek: 208 pp
- Müller M. 2000. *Ausbreitungsökologie der Inara-melone (Acanthosicyos horrida, Cucurbitaceae)*. Diploma, Julius-Maximilian Universität, Würzburg, Germany: 135 pp.
- Müller M. 2004. Seed dispersal ecology of the !nara melon. In: *!NARA fruit for development of the !Khuseb Topnaar*. Henschel J, Dausab R, Moser P, Pallett J (Editors) Namibia Scientific Society, Windhoek: 77-84.
- Müller M. 2006. Dispersal ecology of the !nara-melon along the Kuiseb River, central Namibia. In: *The Changing Culture and Nature of Namibia. Basler Africa Bibliographien*, Basel: 181-184.
- Nel PS. 1983. *Monitering van die beskikbaarheid, gehalte en benutting van voer op die gruisflaktes van die Kuiseb-studiegebied*. MSc, University of the Orange Free State, Bloemfontein: 233 pp.
- Nott K. 1985. *An autecological study of a Namib dune succulent, Trianthema hereroensis*. MSc, University of Natal, Pietermaritzburg: 147 pp.
- Nott K, Savage MJ. 1985. Observations on the utilization of a dune succulent by Namib fauna. *South African Journal of Zoology* **20**: 269-271.
- Nott K, Savage MJ. 1985. Root distribution of *Trianthema hereroensis* in the Namib dunes. *Madoqua* **14**: 181-183.
- Nott K, Savage MJ. 1985. Variation in seasonal and diurnal leaf water potential of a Namib dune succulent. *Madoqua* **14**: 177-179.
- Robinson ER. 1976. *Phytosociology of the Namib Desert Park, South West Africa*. MSc, University of Natal, Pietermaritzburg: 220 pp.
- Robinson ER, Giess W. 1974. Report on the plants noted in the course of a trip from Luderitz Bay to Spencer Bay, January 10 - 21, 1974. *Dinteria*: 13-44.
- Savage MJ, Nott K, Seely MK. 1983. *A comparative autecological study of Trianthema hereroensis in the east and west of the Namib dune system*. Department of Soil Science & Agrometeorology, University of Natal, Pietermaritzburg.
- Seely MK. 1990. Patterns of plant establishment on a linear desert dune. *Israel Journal of Botany* **39**: 443-451.
- Seely MK, Buskirk WH, Hamilton WJ III, Dixon JEW. 1981. Lower Kuiseb River perennial vegetation survey. *Journal of the South West Africa Scientific Society* **35**: 57-86.

- Seely MK, de Vos MP, Louw GN. 1977. Fog imbibition, satellite fauna and unusual leaf structure in a Namib Desert dune plant *Trianthema hereroensis*. *South African Journal of Science* **73**: 169-172.
- Shilomboleni A. 1998. *The Inara and factors that lead to its decline in productivity*. Gobabeb Training and Research Centre (In-house training report) and Polytechnic of Namibia. Windhoek: 17 pp.
- Siteketa V. 2003. *Interaction of livestock and vegetation in the lower Kuiseb River*. Gobabeb Training and Research Centre (In-house training report) and Polytechnic of Namibia. Windhoek: 13 pp.
- Theron GK, van Rooyen N, van Rooyen MW. 1980. Vegetation of the lower Kuiseb River. *Madoqua* **11**: 327-345.
- Theron GK, van Rooyen N, van Rooyen MW. 1985. Vegetation of the lower Kuiseb River. The Kuiseb environment: the development of a monitoring baseline. Huntley BJ (Editor) *South African National Scientific Programmes Report no. 106*, Pretoria: 73-80.
- Theron GK, van Rooyen N, van Rooyen MW, Jankowitz WJ. 1985. Vegetation structure and vitality in the lower Kuiseb. The Kuiseb environment: the development of a monitoring baseline. Huntley BJ (Editor) *South African National Scientific Programmes Report no. 106*, Pretoria: 81-91.
- Tjikurunda H. 2002. *Productivity of camel thorn (*Acacia erioloba*) and Ana tree (*Acacia albida*) species and the factors that may limit maximum production: an index*. Gobabeb Training and Research Centre (In-house training report) and Polytechnic of Namibia, Windhoek: 15 pp.
- Veste M, Mohr M. 2005. Vegetation der Lineardünen der zentralen Namib und deren Ionenhaushalt. In: *Ökologische Forschung im globalen Kontext*. Veste M, Wucherer W, Homeier J (Editors) Cuvillier Verlag, Göttingen: 93-108.
- Vogel JC, Seely MK. 1977. Occurrence of C-4 plants in the central Namib Desert. *Madoqua* **10**: 75-78.
- Ward JD, Breen CM. 1983. Drought stress and the demise of *Acacia albida* along the lower Kuiseb River, central Namib Desert: preliminary findings. *South African Journal of Science* **79**: 444-447.
- Wharton RA, Tilson JW, Tilson RL. 1980. Asynchrony in a wild population of *Ficus sycomorus* L. *South African Journal of Science* **76**: 478-480.
- Yeaton RI. 1988. Structure and function of the Namib dune grasslands: characteristics of the environmental gradients and species distributions. *Journal of Ecology* **76**: 744-758.
- Yeaton RI. 1990. The structure and function of the Namib dune grasslands: species interactions. *Journal of Arid Environments* **18**: 343-350.

Vertebrate behaviour, physiology and ecology – birds

- Berry HH, Millar RP, Louw GN. 1979. Environmental cues influencing the breeding biology and circulating levels of various hormones and triglycerides in the Cape cormorant. *Comparative Biochemistry and Physiology* **62A**: 879-884.
- Boyer HJ. 1987. Larking around - studying birds in the Namib dunes. *Roan News*, Windhoek: 26-27.
- Boyer HJ. 1988. Breeding biology of the dune lark. *Ostrich* **59**: 30-37.
- Cade TJ. 1965. Survival of the scaly-feathered finch *Sporopipes squamifrons* without drinking water. *The Ostrich*: 131-132.
- Cade TJ, Willoughby EJ, MacLean GL. 1966. Drinking behaviour of sandgrouse in the Namib and Kalahari Deserts, Africa. *The Auk* **83**: 124-126.
- Cox GW. 1983. Foraging behaviour of the dune lark. *The Ostrich* **54**: 113-120.
- Dixon JEW, Louw GN. 1978. Seasonal effects on nutrition, reproduction and aspects of thermoregulation in the Namaqua sandgrouse (*Pterocles namaqua*). *Madoqua* **11**: 19-29.
- Glassom D, Branch GM. 1997. Impact of predation by greater flamingos *Phoenicopterus ruber* on the macrofauna of two southern African lagoons. *Marine Ecology Progress Series*: **149**: 1-12.
- Glassom D, Branch GM. 1997. Impact of predation by greater flamingos *Phoenicopterus ruber* on the meiofauna, microflora, and sediment properties of two southern African lagoons. *Marine Ecology Progress Series*: **150**: 1-10.
- Immelmann K, Immelmann G. 1968. Zur Fortpflanzungsbiologie einiger Vögel in der Namib. *Bonner Zoologische Beiträge* **3-4**: 329-339.
- McCulloch G, Aebischer A, Irvine K. 2003. Satellite tracking of flamingos in southern Africa: the importance of small wetlands for management and conservation. *Oryx* **37**(4): 480-483.
- Nel JAJ. 1969. The prey of owls in the Namib Desert. 1: the spotted eagle owl *Bubo africanus* at Sossus Vlei. *Scientific Papers of the Namib Desert Research Station*: 55-58.

- Safriel UN. 1990. Winter foraging behaviour of the dune lark in the Namib Desert, and the effect of prolonged drought on behaviour and population size. *Ostrich* **61**: 77-80.
- Stuart CT. 1975. A short note on the diet of *Tyto alba* at Sandwich Harbour, Namib Desert Park, South West Africa. *Madoqua* Series II **4**: 103.
- Tilson RL, Kok OB. 1980. Habitat ecology of black storks in the Kuiseb River. *Madoqua* **11**: 347-349.
- Tilson RL, LeRoux P. 1983. Resource partitioning in coexisting Namib Desert owls, *Bubo africanus* and *Tyto alba*. *Madoqua* **13**: 221-227.
- Williams JB. 1999. Heat production and evaporative water loss of dune larks from the Namib Desert. *The Condor* **101**: 432-438.
- Williams JB. 2001. Energy expenditure and water flux of free-living dune larks in the Namib: a test of the reallocation hypothesis on a desert bird. *Functional Ecology* **15**: 175-185.
- Willoughby EJ. 1967. *Desert adaptations of larks of the central Namib Desert, South West Africa*. PhD, Syracuse University, Syracuse, New York: 151 pp.
- Willoughby EJ. 1968. Water economy of the Stark's lark and grey-backed finch-lark from the Namib Desert of South West Africa. *Comparative Biochemistry and Physiology* **27**: 723-745.
- Willoughby EJ. 1971. Biology of larks (Aves: Alaudidae) in the central Namib Desert. *Zoologica Africana* **6**: 133-176.

Vertebrate behaviour, physiology and ecology – mammals

- Bothma JdP, Nel JAJ. 1980. Winter food and foraging behaviour of the aardwolf *Proteles cristatus* in the Namib-Naukluft Park. *Madoqua* **12**: 141-149.
- Bothma JdP, Nel JAJ, Macdonald A. 1984. Food niche separation between four sympatric Namib Desert carnivores. *Journal of Zoology*, London **202**: 327-340.
- Boyer D. 1985. Interaction of two *Gerbillurus* species in the Namib. *South African Journal of Science* **81**: 704.
- Boyer DC. 1987. *Effect of rodents on plant recruitment and production in the dune area of the Namib Desert*. MSc, University of Natal, Pietermaritzburg: 232 pp.
- Boyer DC. 1988. Tree rats in the Namib dunes. *Madoqua* **15**: 341-342.
- Brain C. 1990. Spatial usage of a desert environment by baboons (*Papio ursinus*). *Journal of Arid Environments* **18**: 67-73.
- Brain C. 1993. *The eco-physiology of baboons living in the Kuiseb River Canyon, Namibia*. PhD, University of the Witwatersrand, Johannesburg: 198 pp.
- Buffenstein R. 1984. The importance of microhabitat in thermoregulation and thermal conductance in two Namib rodents - a crevice dweller, *Aethomys namaquensis*, and a burrow dweller, *Gerbillurus paeba*. *Journal of Thermal Biology* **9**: 235-241.
- Buffenstein R, Campbell WE, Jarvis JUM. 1985. Identification of crystalline allantoin in the urine of African Cricetidae (Rodentia) and its role in their water economy. *Journal of Comparative Physiology B* **155**: 493-499.
- Dednam H. 1988. Species occurrence and densities of rodents at Visnara in the Namib Desert. Gobabeb Training and Research Institute, Cape Technikon, Gobabeb: 2-22.
- Dempster ER, Perrin MR. 1989. A comparative study of agonistic behaviour in hairy-footed gerbils (genus *Gerbillurus*). *Ethology* **83**: 43-59.
- Dempster ER, Perrin MR. 1989. Male-female interactions in hairy-footed gerbils (genus *Gerbillurus*). *Ethology* **83**: 326-334.
- Dempster ER, Perrin MR. 1989. Maternal behaviour and neonatal development in three species of Namib Desert rodents. *Journal of Zoology, London* **218**: 407-419.
- Dempster ER, Perrin MR. 1990. A preliminary description of body maintenance behaviour of four *Gerbillurus* species. *Madoqua* **17**: 41-45.
- Dempster ER, Perrin MR, Downs CT, Griffin M. 1998. *Gerbillurus setzeri*. *Mammalian Species* **598**: 1-4.
- Downs CT. 1989. *The ecophysiology of four Gerbillurus species with special reference to their temperature and water regulation*. PhD, University of Natal, Department of Zoology, Pietermaritzburg: 210 pp.
- Downs CT, Perrin MR. 1989. An investigation of the macro- and micro-environments of four *Gerbillurus* species. *Cimbebasia* **11**: 41-54.

- Downs CT, Perrin MR. 1991. Urinary concentrating ability of four *Gerbillurus* species of southern African arid regions. *Journal of Arid Environments* **20**: 71-81.
- Fielden LJ. 1989. *Selected aspects of the adaptive biology and ecology of the Namib Desert golden mole (Eremitalpa granti namibensis)*. PhD, University of Natal, Department of Zoology & Entomology, Pietermaritzburg: 247 pp.
- Fielden LJ. 1991. Home range and movements of the Namib desert golden mole, *Eremitalpa granti namibensis* (Chrysochloridae). *Journal of Zoology, London* **223**: 675-686.
- Fielden LJ, Hickman GC, Perrin MR. 1992. Locomotory activity in the Namib Desert golden mole *Eremitalpa granti namibensis* (Chrysochloridae). *Journal of Zoology, London* **226**: 329-344.
- Fielden LJ, Perrin MR, Hickman GC. 1990. Feeding ecology and foraging behaviour of the Namib Desert golden mole, *Eremitalpa granti namibensis* (Chrysochloridae). *Journal of the Zoological Society, London* **220**: 367-389.
- Fielden LJ, Perrin MR, Hickman GC. 1990. Water metabolism in the Namib Desert golden mole, *Eremitalpa granti namibensis* (Chrysochloridae). *Comparative Biochemistry and Physiology* **96A**: 227-234.
- Fielden LJ, Waggoner JP, Perrin MR, Hickman GC. 1990. Thermoregulation in the Namib Desert golden mole, *Eremitalpa granti namibensis* (Chrysochloridae). *Journal of Arid Environments* **18**: 221-237.
- Gasc JP, Jouffroy FK, Renous S, von Blottnitz F. 1986. Morphofunctional study of the digging system of the Namib Desert golden mole (*Eremitalpa granti namibensis*): cinefluorographical and anatomical analysis. *Journal of Zoology, London (A)* **208**: 9-35
- Goldenberg F, Glanzl M, Henschel JR, Funk SM, Millesi E. 2008. Gait choice in desert-living black-backed jackals. *Journal of Zoology* **275**: 124-129.
- Goldenberg M, Goldenberg F, Funk SM, Henschel J, Millesi E. 2010. Diet composition of black-backed jackals, *Canis mesomelas* in the Namib Desert. *Folia Zool.* **59**: 93-101.
- Goodman E. 2003. *Investigating producer-scrounger dynamics in social foraging chacma baboons (Papio ursinus)*. MSc, University of York, Institute of Zoology, London.
- Henschel JR. 1977. *Energy requirements, food utilization and specializations of the digestive systems in three species of Namib desert rodents*. BSc, Honours University of Cape Town, Cape Town: 39 pp.
- Holm E. 1969. Contribution to the knowledge of the biology of the Namib Desert golden mole, *Eremitalpa granti namibensis* Bauer & Niethammer 1959. *Scientific Papers of the Namib Desert Research Station*: 37-42.
- Hughes JJ. 1990. *Predation risk and competition in a desert rodent community*. MSc, University of Natal, Pietermaritzburg: 97 pp.
- Hughes JJ, Ward D. 1993. Predation risk and distance to cover affect foraging behaviour in Namib Desert gerbils. *Animal Behaviour* **46**: 1243-1245.
- Hughes JJ, Ward D, Perrin MR. 1994. Predation risk and competition affect habitat selection and activity of Namib Desert gerbils. *Ecology* **75**: 1397-1405.
- Hughes JJ, Ward D, Perrin MR. 1995. Effects of substrate on foraging decisions by a Namib Desert gerbil. *Journal of Mammalogy* **76**: 638-645.
- Kilian JW. 1995. The ecology of gemsbok (*Oryx gazella gazella*) in the southern Namib. Ministry of Environment and Tourism (MET and Gobabeb Training and Research Centre), (June 1995) Windhoek. (Internal report)
- Krug CB. 2002. *Adaptations of the four-striped field mouse (Rhabdomys pumilio, Sparman 1784) to the Namib Desert*. PhD, Rheinische Friedrich-Wilhelms-Universität, Bonn: 1-180.
- Krug CB. 2004. Survival in the Namib: adaptations of the striped mouse to an arid environment. *Transactions of the Royal Society of South Africa* **59**: 93-98.
- Krug CB. 2007. Reproduction of *Rhabdomys pumilio* in the Namib Desert: pattern and possible control. *Basic and Applied Dryland Research* **1**: 67-85.
- Laycock PA. 1975. A brief gerbil trapping survey in an inter-dune valley in the Namib Desert. *Madoqua Series II* **4**: 95-97.
- Mitchell D, Goelst K, Seely MK. 1992. How do chthonic Namib mammals generate heat? (abstract). *Proceedings: African Association of Physiological Sciences*, Pretoria: 8.
- Narins PM, Lewis ER, Jarvis JUM, O'Riain J. 1997. The use of seismic signals by fossorial Southern African mammals: a neuroethological gold mine. *Brain Research Bulletin* **44**: 641-646.

- Perrin MR, Boyer DC. 1994. The effect of rodents on plant recruitment and production in the dune fields of the Namib Desert. *Tropical Zoology* **7**: 299-308.
- Perrin MR, Boyer H, Boyer DC. 1992. Diets of the hairy-footed gerbils *Gerbillurus paeba* and *G. tytonis* from the dunes of the Namib Desert. *Israel Journal of Zoology* **38**: 373-383.
- Seely MK. 1977. Sand solidified by gemsbok urine as selected burrow sites by gerbils. *Zoologica Africana* **12**: 247-249
- Seymour RS. 1998. Sand-swimming moles. *Journal of the Namibia Scientific Society* **39**: 20-21.
- Seymour RS. 1998. Sand-swimming moles. *Nature Australia, Australia*: 15-16.
- Seymour RS, Seely MK. 1996. The respiratory environment of the Namib Desert golden mole. *Journal of Arid Environments* **32**: 453-461.
- Seymour RS, Withers PC, Weathers WW. 1998. Energetics of burrowing, running, and free-living in the Namib Desert golden mole (*Eremitalpa namibensis*). *Journal of Zoology, London* **244**: 107-117.
- Stuart CT. 1975. Marine fauna collected at Sandwich Harbour, Namib Desert Park, South West Africa. *Madoqua Series II* **4**: 101-102.
- Stuart CT. 1975. Preliminary notes on the mammals of the Namib Desert Park. *Madoqua Series II* **4**: 5-68.
- Stuart CT. 1975. The sex ratio of steenbok *Raphicerus campestris* Thunberg in the Namib Desert Park, South West Africa. *Madoqua Series II* **4**: 93-94.
- Stuart CT. 1976. Diet of the black-backed jackal *Canis mesomelas* in the Central Namib Desert, South West Africa. *Zoologica Africana* **11**: 193-205.
- Stuart CT. 1976. Hyaenas - plant food in the diet of the spotted hyaena. *South African Journal of Science* **72**: 148.
- Stuart CT. 1976. Rainfall and small mammals in the Namib Desert. *South West African Annual*, Windhoek: 64.
- Stuart CT. 1977. Analysis of *Felis libyca* and *Genetta genetta* scats from the central Namib Desert, South West Africa. *Zoologica Africana* **12**: 239-241.
- Tilson R, Henschel J. 1987. The spotted hyaena - predator of the Namib night. *African Wildlife, Johannesburg*: 50-56.
- Tilson R, von Blottnitz F, Henschel J. 1980. Prey selection by spotted hyaena (*Crocuta crocuta*) in the Namib Desert. *Madoqua* **12**: 41-49.
- Tilson RL. 1977. Palewinged starlings and klipspringers in the Kuiseb Canyon, Namib Desert Park. *Ostrich* **48**: 110-111.
- Tilson RL. 1983. Carcass protocol. *Natural History* **3**: 42-48.
- Tilson RL, Henschel JR. 1984. Spotted hyaenas in the central Namib Desert. *South African Journal of Science* **80**: 185.
- Tilson RL, Henschel JR. 1986. Spatial arrangement of spotted hyaena groups in a desert environment, Namibia. *African Journal of Ecology* **24**: 173-180.
- Withers PC, Louw GN, Henschel J. 1980. Energetics and water relations in Namib Desert rodents. *South African Journal of Zoology* **15**: 131-137.

Vertebrate behaviour, physiology and ecology - reptiles

- Austin B. 2003. Lizard telemetry: an exercise in passive monitoring, skulduggery and embargoes. *South African Journal of Science* **99**: 6-8.
- Bauer AM, Russell AP. 1991. Pedal specialisations in dune-dwelling geckos. *Journal of Arid Environments* **20**: 43-62.
- Brain CK. 1960. Observations on the locomotion of the South West African adder, *Bitis peringueyi* (Boulenger), with speculations on the origin of sidewinding. *Annals of the Transvaal Museum, Pretoria* **24**: 19-24.
- Brain CK. 1962. Observations on the temperature tolerance of lizards in the central Namib Desert, South West Africa. *Cimbebasia* **4**: 1-5.
- Burrage BR. 1973. Comparative ecology and behaviour of *Chamaeleo pumilis* (Gmelin) and *C. namaquensis* A. Smith (Sauria: Chamaeleonidae). *Annals of the South African Museum* **61**: 1-158.
- Cloudsley-Thompson JL. 1988. Strategies for survival of desert reptiles. In: *Ecophysiology of desert vertebrates*. Ghosh PK, Prakash I (Editors) Scientific Publishers, Jodhpur, India: 187-288.

- Cloudsley-Thompson JL. 1991. A note on the reptiles of the Namib Desert. *Bulletin of the British Herpetological Society*: 7-9.
- Cooper PD, Robinson MD. 1990. Water balance and bladder function in the Namib Desert sand dune lizard, *Aporosaura anchietae* (Lacertidae). *Copeia* **1**: 34-40.
- Dixon JEW. 1974. A note on *Leptotyphlops* Fitzinger in South West Africa. *Madoqua Series II* **3**: 33-35.
- Goldberg SR, Robinson MD. 1979. Reproduction in two Namib Desert lacertid lizards (*Aporosaura anchietae* and *Meroles cuneirostris*). *Herpetologica* **35**: 169-175.
- Haacke WD. 1969. The call of the barking geckos (Gekkonidae: Reptilia). *Scientific Papers of the Namib Desert Research Station*: 83-93.
- Hoffmann LAC. 1988. Note on the ecology of the horned adder *Bitis caudalis* (A. Smith) from Gobabeb, Namib-Naukluft Park. *Journal of the Herpetological Association of Africa* **35**: 33-34.
- Holm E. 1973. The influence of constant temperatures upon the circadian rhythm of the Namib Desert dune lizard *Aporosaura anchietae* Bocage. *Madoqua, Series II* **2**: 33-41.
- Louw GN, Holm E. 1972. Physiological, morphological and behavioural adaptations of the ultrasammophilous Namib Desert lizard *Aporosaura anchietae* (Bocage). *Madoqua Series II* **1**: 67-85.
- Murray GW, Schramm D. 1987. A comparative study of the diet of the wedge-snouted sand lizard, *Meroles cuneirostris* (Strauch), and the sand diving lizard, *Aporosaura achietae* (Bocage), (Lacertidae), in the Namib Desert. *Madoqua* **15**: 55-61.
- Nagy KA, Shemanski DR. 2009. Observations on diet and seed digestion in a sand dune lizard, *Meroles anchietae*. *African Journal of Herpetology* **58**: 39-43.
- Pietruszka RD. 1986. Search tactics of desert lizards: how polarized are they? *Animal Behaviour* **34**: 1742-1758.
- Pietruszka RD. 1987. On the application of stomach-flushing to Namib Desert lizards. *Madoqua* **15**: 73-78.
- Pietruszka RD. 1988. Maxithermy and the thermal biology of an herbivorous sand dune lizard. *Journal of Arid Environments* **14**: 175-185.
- Polakow DA. 1997. *Communication and sexual selection in the barking gecko (Ptenopus kochi)*. MSc, University of Cape Town, Department of Zoology, Cape Town: 207 pp
- Reiserer, R.S. and DeNardo, D.F. 2000. Natural history observations on *Bitis peringueyi* (Boulenger) (reptilian: Viperidae) Cimbebasia **16**: 195-198.
- Robinson MD. 1977. Social status and energy expenditure of male Namib Desert sand-diving lizards. *Namib Bulletin*, Gobabeb: 11-12.
- Robinson MD. 1978. Sexual dichromatism in the Namaqua chamaeleon, *Chamaeleo namaquensis*. *Madoqua* **11**: 81-83.
- Robinson MD. 1979. Karyology, phylogeny and biogeography of the Namaqua chamaeleon, *Chamaeleo namaquensis* Smith, 1831 (Chamaeleonidae, Reptilia). *Beaufortia* **28**: 153-156.
- Robinson MD. 1987. Diet diversity and prey utilization by the omnivorous Namib desert dune lizard, *Aporosaura anchietae* (Bocage), during two years of very different rainfall. *Journal of Arid Environments* **13**: 279-286.
- Robinson MD. 1990. Comments on the reproductive biology of the Namib desert dune lizard, *Aporosaura anchietae*, during two years of very different rainfall. In: *Namib ecology 25 years of Namib research*. Seely MK (Editor) Transvaal Museum, Pretoria: 163-168.
- Robinson MD. 1990. Summer field energetics of the Namib desert dune lizard *Aporosaura anchietae* (Lacertidae), and its relation to reproduction. *Journal of Arid Environments* **18**: 207-216.
- Robinson MD, Cunningham AB. 1978. Comparative diet of two Namib Desert sand lizards (Lacertidae). *Madoqua* **11**: 41-54.
- Robinson MD, Hughes DA. 1978. Observations on the natural history of Peringuey's adder, *Bitis peringueyi* (Boulenger) (Reptilia: Viperidae). *Annals of the Transvaal Museum, Pretoria* **31**: 190-196.
- Stuart CT. 1980. A note on tail regeneration in a sample of *Meroles cuneirostris* from the central Namib Desert. *Journal of the Herpetological Association of Africa* **23**: 13.
- Zeitler U. 1999. *Untersuchungen zum Ruf des Bellgeckos (Ptenopus garrulus maculatus) und der Ökologie seines Einsatzes*. Biology Diploma, Humboldt University, Berlin: 83 pp.

World Heritage Council / IUCN

- Bailey RG, Hogg HC. 1986. A World Ecoregions Map for Resource Reporting. *Environmental Conservation* **13**: 195-202.
- Dingwall P, Weighell T, Badman T. 2005. *Geological World Heritage: A Global Framework. A contribution to the Global Theme Study of World Heritage Natural Sites. Protected Area Programme, IUCN.* 51 pp.
- Goudie A, Seely M. 2011. *World Heritage Desert Landscapes.* Gland, Switzerland, IUCN: 44 pp.
- Udvardy MDF. 1975. *A Classification of the Biogeographical Provinces of the World.* IUCN Occasional Paper No. 18, IUCN, Morges, Switzerland: 41 pp.
- WHC-04/28.COM/INF.13B. 2004. *The World Heritage List: Future priorities for a credible and complete list of natural and mixed sites.* IUCN, Gland: 21 pp.

Annex 22

Relevant Curriculum Polytechnic of Namibia



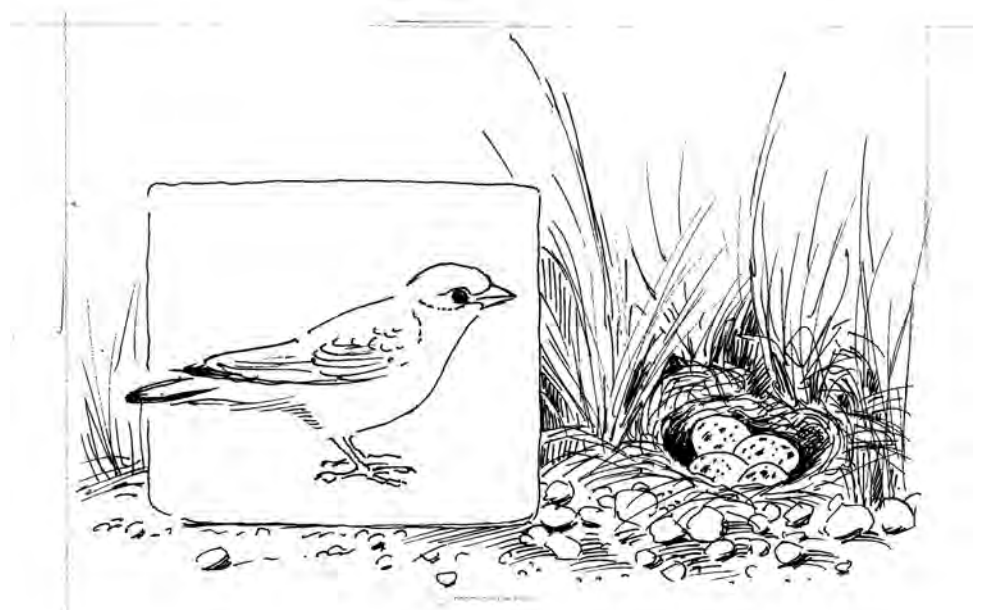
Relevant courses at the Polytechnic of Namibia as per Prospectus 2011

Course Name	Code	Year	Department
Plant Identification	PID110S	1	Nature Conservation
Nature Conservation Administration	NAT5001	1	Nature Conservation
Nature Conservation Techniques (Module A)	NCT110S	1	Nature Conservation
Nature Conservation Techniques (Module B)	NCT120S	1	Nature Conservation
Nature Conservation Techniques (Module C)	NCT130S	1	Nature Conservation
Law Enforcement	NAT5002	1	Nature Conservation
Computer Usage	RGB111N	1	Nature Conservation
Nature Conservation Calculations	NCA110S	1	Nature Conservation
Animal Studies 1	NAT0100	1	Nature Conservation
Plant Studies 1	NAT5100	1	Nature Conservation
Nature Conservation Ecology 1	NAT1100	1	Nature Conservation
Animal Studies 2	NAT0200	1	Nature Conservation
Plant Studies 2	NAT5200	1	Nature Conservation
Nature Conservation Ecology 2	NAT1200	1	Nature Conservation
Nature Conservation Techniques 1	NAT4100	1	Nature Conservation
Communication Skills	CSK0420	1	Nature Conservation
Our Environment: Issues, risks and responses	OEM101Y	1	Nature Conservation
Animal Studies 3	NAT0300	2	Nature Conservation
Environmental Conservation Development	NAT2100	2	Nature Conservation
Methodology of Environmental Education	MEE221S	2	Nature Conservation
Nature Conservation Ecology 3	NAT1300	2	Nature Conservation
Nature Conservation Techniques 2	NAT4200	2	Nature Conservation
Plant Studies 3	NAT5300	3	Nature Conservation
Nature Conservation Techniques 3	NAT4300	3	Nature Conservation
Aquatic Ecosystem Management	NAT6003	3	Nature Conservation
Natural Resource Management	NRM210S	3	Nature Conservation
Plant Studies IV (Module A)	PSO411Z	4	Nature Conservation
Resource Management IV (Module A)	RMM451U	4	Nature Conservation
Conservation Management	CVM112Y	4	Nature Conservation
Plant Studies IV (Module B)	PSO421Y	5	Nature Conservation
Financial Management I (Nature Conservation)	FMN451Z	5	Nature Conservation
Management Principles I (Nature Conservation)	POM191R	5	Nature Conservation
Resource Management IV (Module B)	RMM461T	5	Nature Conservation
Community-Based Natural Resource Management	CBR410Y	5	Nature Conservation
Geographic Information Systems 1	GES512S	1	Land Management

Introduction to Databases 1B	IDB220S	1	Land Management
Introduction to Geospatial Data	IGD411S	1	Land Management
Introduction to Survey and Mapping	ISM110S	1	Land Management
Basic Ecology	BEC110S	1	Land Management
Natural Resource Management 1	NRT120S	1	Land Management
Community Based Land Use Management 1	CBL120S	1	Land Management
Introduction to Land Use Planning and Management	ILP510S	2	Land Management
Land Tenure Systems	LTS520S	2	Land Management
Land Information Systems	LIS610S	2	Land Management
Introduction to Geography	IGE420S	2	Land Management
Natural Resource Management 2	NRT210S	2	Land Management
Natural Resource Management 3	NRT220S	2	Land Management
Introduction to Biology	IBI510S	1	Agriculture
Soil Science	SSA120S	1	Agriculture
Rangeland Science	RSC112S	1	Agriculture
Rangeland Management	RMN211S	2	Agriculture

Annex 23

Relevant Curriculum University of Namibia

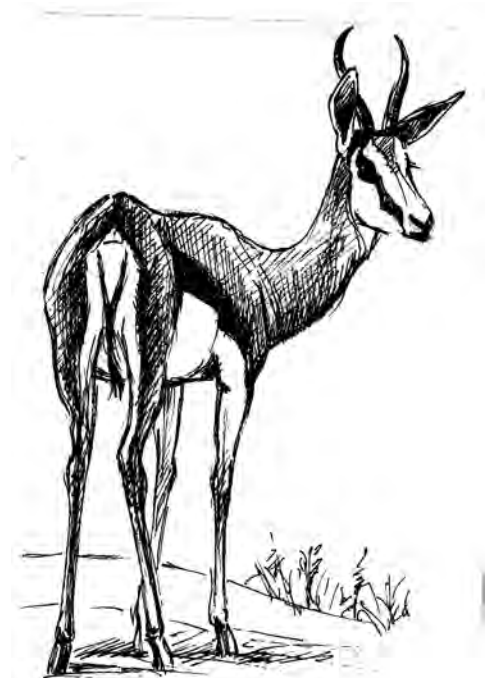


Relevant courses at the University of Namibia as per Prospectus 2011.

Course Name	Code	Year	Credits	Degree
Biology	AASC 2401	1	8	BSc
Plant Taxonomy	AIES 2422	1	8	BSc
General Ecology	AIES 2442	1	8	BSc
Introduction to Biology	SBLG 3411	1	16	BSc
Diversity of Life	SBLG 3512	1	16	BSc
Soil Science	ACSC 2512	2	16	BSc
Vegetation assessment and Monitoring Techniques	AIES 2501	2	8	BSc
Wildlife Survey Techniques and Monitoring	AIES 2521	2	8	BSc
Ecology	AIES 3601	2	8	BSc
Principles of Wildlife Management	AIES 3621	2	8	BSc
Environmental Science	AIES 3641	2	8	BSc
Plant Physiology	AIES 3682	2	12	BSc
General Soil Science	AIES 3602	2	8	BSc
Forest and Veld Fire Management	AIES 2512	2	16	BSc
Wildlife Diseases	AWLM 3882	2	12	BSc
Ornithology and Mammalogy	AWLM 3811	2	16	BSc
Water Management and Soil Conservation	ACSC 2601	3	8	BSc
Game Farming	AASC 2602	3	8	BSc
Community Based Natural Resource Management (CBNRM)	AIES 2631	3	16	BSc
Game Ranching	AASC 3742	3	8	BSc
Conservation Biology	ANRC 3792	3	12	BSc
Population and Community Ecology	AIES 3781	3	12	BSc
Rangeland Management	AWLR 3831	3	16	BSc
Management of Arid and Semi-Arid Lands	AENV 3882	3	12	BSc
Intro Integrated Resource Management	AASC 5981	1	12	MSc
Rangeland Ecosystem Structure and Function	AASC 5991	1	12	MSc
Soil Dynamics	AASD 5981	1	12	MSc
Water Dynamics	AASW 5981	1	12	MSc
Environmental Physiology	AASE 5981	1	12	MSc
Land Use Planning	AASL 5981	1	12	MSc
Fodder Flow	AASF 5981	1	12	MSc
Rangeland Management	AASR 5981	1	12	MSc
Wildlife Ecology and Management	AASC 5982	1	12	MSc
Rangeland Degradation and its Mitigation	AASC 5992	1	12	MSc
Range Biodiversity and Conservation	AASR 5982	1	12	MSc

Annex 24

Stakeholders Consulted during Preparation of this Nomination Dossier



24a - From: Minutes of Honourable Ministers' meeting on the Southern Namib Sand Sea Nomination Dossier

20 July 2011

Attendance

1. Hon. Dr. Abraham Iyambo – Minister of Education and **Chairperson**
2. Hon. Mr. Isak Katali – Minister, MME
3. Hon. Mr. Pohamba Shifeta – Deputy Minister, MYNSSC
4. Hon. Mr. Kilus Nguvauva – Deputy Minister, MFMR
5. Dr. Gabi Schneider – MME
6. Dr. Nashilongo Shivute – MLR
7. Mr. Damir Dijakovic – UNESCO Windhoek Cluster Office
8. Ms. Esther Moombolah-Goagoses – NMN
9. Mr. Marius Kudumo – NATCOM Secretariat
10. Ms. Frieda Kanime - NATCOM Secretariat
11. Mr. Ferdinand Katire – NATCOM Secretariat
12. Ms. Anne Borchert – NATCOM Secretariat

Apologies

- Hon. Netumbo Nandi-Ndaitwah- Minister, MET
- Hon. Alpheus !Naruseb – Minister, MLR

24b - From: Gobabeb World Heritage Nomination Dossier Preparation Training Course

21 August – 2 September 2011

Name	Country
ABUNGU, George	Kenya
ALIYU, Aliyu	Nigeria
BALSAMO, Alessandro	Italy
BADMAN Tim	UK
BARBE, Therese	Seychelles
BARRA, Julienne	Seychelles
DARSOT, Leon	France
DEACON, Jeanette	South Africa
ELNOUR OGEIL, Eltahir	Sudan
HAGOS, Futsum	Eritrea
KANYEMBA, Linda	Zambia
KHIDER TAHA, Rihab	Sudan
KIRIAMA, Herman	Kenya
MAHASHA, Raditshaba	South Africa

MUGHONGORA, Vincent	Namibia
MULAUDZI, Amos	South Africa
MUSALIZI, Sarah	Uganda
NYIRACYIZA, Jackie	Uganda
PALMER, Guy	South Africa
PAULOS, Thomas	Eritrea
PRINS SOLANI, Deirdre	South Africa
RUHOMAUN, Kevin	Mauritius
SOOBARAH, G.	Mauritius
SURAYU WUDIL, Yusuf	Nigeria
TARUVINGA, Pascal	Zimbabwe
Gobabeb Training and Research Centre participants:	Namibia
Grummon, Christine	
Kapalaga, Taimi	
McElroy, Laura	
Siyaya, Annetjie	
Tjilumbu, Lahja	
Ward, Vivienne	

24c – From: Attendees of Regional Governors’ and Traditional Leader’s briefing session on the Namib Sand Sea, World Heritage Site, Gobabeb, 18 October 2011

Name	Position	Organisation	e-mail
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Mr Linus Garoeb	CRO	ERC	lgaroeb@erc.com
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Ms Katrina M. Hanse-Himarwa	Governor	Hardap Region Council	rashidtryane@yahoo.com; kmhansehimarwa@hardaprc.com.na
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Mr Bernadus Swartbooi	Governor	KRC	bernadus@karasrc.com
Mr Dawid Tiboth	Office of the Governor	KRC	david@karasrc.com
Topnaar TA			
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Mr Joel Kooitjie	MAWF-DEES/ Topnaar		joelkooitjie@yahoo.com
Mr Seth Kooitjie	Traditional Chief		081 277 5899
Other			
Dr Eugene Marais	Chief Curator	National Museum of Namibia	Eugene.marais@gmail.com
Mr Manie le Roux	Chief Control Officer	MET	Met.nnp@iway.na
Dr Mary Seely	Associate	Gobabeb Training and Research Centre	Mary.seely@drfn.org.na
Dr Peingeondjabi Titus Shipoh	PS	MYNSSC	ps@mynssc.gov.na
Mr Vincentius Mughongora	Technician	National Museum of Namibia	Vince100@webmail.co.za

24d – From: World Heritage Site Briefing & NAMPLACE Inception Meeting, Sossusvlei Lodge

11 November 2011

Name	Company/organisation	Contact details
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Jonathan /Uiseb	NNR	juiseb@nwr.com.na 081 287 9344 fax: 063 693257
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REPUBLIC OF NAMIBIA

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NAMIBIA NATIONAL COMMISSION FOR UNESCO

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Private Bag 13391
Windhoek

Enquiries: Ms F Kanime

21 February 2013

The Director
UNESCO World Heritage Centre
7, Place de Fontenoy
75352 Paris 07 SP
France

Dear Dr. Rao,

Subject : The Namib Sand Sea Nomination Dossier – Supplementary information

The Namibia National Commission for UNESCO has the honour to submit the supplementary information on the Namib Sand Sea Nomination Dossier on behalf of Namibia, as requested by the Director of the World Heritage Programme in the letter dated 20 December 2012.

The attached documents are as follows:


1. Response document on the four questions raised in the letter addressed to Namibia.
2. Approved management plans of the Namib Naukluft Park.
3. Map of the draft management zoning of the Namib Sand Sea.
4. Map of current exclusive prospecting mining licences in and around the Namib Sand Sea.
5. Namibia's National Policy on protected areas, neighbours and Resident Communities.

6. Namibian Minerals (Prospecting and mining) Act.

7. Letter of support for the nomination from Chief Seth Kooitjie, the Representative of the Topnaar Indigenous Peoples of Namibia.

It is our sincere hope that the supplementary information and the attached documents would provide additional information, and we look forward to hear from you soon.

Yours sincerely,



Dr. Marius Kudumo

Secretary-General: Namibia National Commission for UNESCO



Namib Sand Sea World Heritage Nomination: Supplementary Information

1. Introduction

This purpose of this communication is to provide the supplementary information, as requested in the letter from Mr. Tim Badman, Director of the World Heritage Programme dated 20 December 2012, which was addressed to H.E. Ms Frieda Nangula Ithete, Ambassador of the Republic of Namibia to France and Permanent Delegate to UNESCO. The supplementary information will focus on the main points, as indicated in the communication referred to.

2. Management plan and maps of the management zones

The final version of the management plans of the property, including those of the larger conservation area within which it is situated, are attached. The management plans have been approved by the Executive Management Team of the Ministry of Environment and Tourism, and have been submitted to the Minister for signature, and to become in force. The State Party will in due course inform the World Heritage Centre of the date of signature, and of becoming into force.

The State Party is submitting the attached map of the draft management zones of the nominated property. The State Party has indicated to the evaluation team during their mission to Namibia from 17-24 September 2012 that the map of the management zones was a specific management activity with timeframes. Consultations with various stakeholders are being carried out before the map of the management zone is finalized. At this point in time, such consultations are ongoing. It is envisaged that an operational management zoning map for the Namib Sand Sea and its buffer zone should be in place by June 2013.

3. Clarification regarding extensions to the Namib Sand Sea and further nominations in the Namib Desert

It is important to clearly state the view of the State Party in responding to the request for supplementary information regarding plans for further nominations in the Namib Desert for inscription on the World Heritage List, and whether these could be considered as further

extensions of the existing property. In responding to the question, the State Party will provide further clarity on the nomination, and expand on whether:

- the Namib Sand Sea is nominated as a distinct site or to represent the greater Namib Desert;
- the attributes and values explained in the nomination dossier are specific to the Namib Sand Sea or the general attributes for the greater Namib Desert;
- the reference to potential future extensions in the nomination dossier relate to sites compatible with the Namib Sand Sea nomination or to non-Sand Sea sites in the greater Namib Desert; and
- dune landscapes as accounted for in the Namib Sand Sea nomination are indistinguishable from other landscapes in the greater Namib Desert.

The attributes and values in the nomination dossier are specific to the Namib Sand Sea, although some of them are also individually, but not collectively, applicable elsewhere. The Namib Sand Sea was nominated as a distinct site, and not to represent the greater Namib Desert. Reference to potential future extensions relates only to sites compatible with the Namib Sand Sea. The Namib Desert dune landscapes in their totality, as accounted for in the Namib Sand Sea nomination, are unique to the Namib Sand Sea.

The description of the property and the justification for inscription distinctly relates to distinct aesthetic, geological, ecological and biodiversity attributes and values of the Namib Sand Sea, and not to common features of the greater Namib Desert. Any future extensions to the property or boundary adjustments shall therefore ,endeavour to contribute to those attributes and values for which the Namib Sand Sea is nominated, and not parts of the greater Namib Desert unrelated to sand sea dynamics. At this point in time, no planning or consultations have been initiated or foreseen for such extensions.

Namibia recognizes that it, and other potential State Parties, would need to evaluate the potential Outstanding Universal Value of additional criteria or geographical areas in the context of the Namib Sand Sea nomination when considering extensions to the property. Any potential extensions that do not contribute to the attributes of Outstanding Universal Value in terms of the Namib Sand Sea nomination, even though such extensions may assist in the appreciation of the criteria for which the Namib Sand Sea has been nominated. For example, broad-ranging

attributes of the greater Namib Desert may be covered by boundary adjustments to the buffer zone, and not as extensions (Martin & Piatti 2009).

Namibia is also committed that practical mechanisms for effective management have to be in place before potential future extensions to the nominated area as well as boundary adjustments would be considered (Namib Sand Sea Nomination, p. xvii, "*Future serial extensions will be considered as the conservation and management situation of the greater Namib Desert evolves*)."

Geological and ecological dynamics in deserts throughout the world are broadly similar. Sand dune systems, and even sand seas, are not synonymous with deserts even though dune dynamics are best appreciated under extreme desert conditions. The local geological settings and biotic setting determine the way in which those arid land dynamics are expressed in terms of landscape and biodiversity. One aspect of which is the evolution of extensive sand dune landscapes and specialist biota adapted to survival in such challenging habitats. Sand dune ecology and the evolution or non-evolution of specialist biota is related to the prevalent abiotic conditions with very different ecologies where extensive expanses of sand dunes occur in different biomes. For example, the hyperarid Namib and more mesic Kalahari sand seas in Namibia have different ecological systems and specialist biotas as the biodiversity and interactions between sand dune inhabitants are related to the biotic conditions and evolutionary history in different locations. Even within the Namib Sand Sea a range of ecological conditions can be identified, as described in the nomination dossier, which is related to different sources of moisture and geological and geomorphological aspects of sand dune dynamics. The Namib Sand Sea nomination encapsulates the main elements of these processes, though other extensive sand dune habitats elsewhere within the greater Namib Desert harbours different suites of endemic biota and examples of the geological and geomorphological processes that may augment and amplify the attributes and values described in the Namib Sand Sea nomination dossier. It is envisioned that future extensions to the Namib Sand Sea would include such attributes and values that are not wholly captured in the initial nomination.

The greater Namib Desert contains a variety of other geological, ecological and biodiversity complexes that resulted in different landscape features, distinct and unusual ecological complexes and suites of endemic biota at different locations. These are distinctly different from

those attributed to the Namib Sand Sea even though the broader arid-land processes exert parallel influences. The ecological and biodiversity complexes in particular are related to large-scale latitudinal substrate and moisture regimes interacting differentially along the length of the greater Namib Desert. Intensive research originating from the Namib Sand Sea provided the theoretical basis to explain not only the evolutionary and deterministic processes for biotic complexes in the greater Namib Desert, but arid land ecosystems throughout the world. Palaeontological sites outside the nominated area provided confirmation on the evolution of the extant biodiversity and associated ecological interaction with the onset and intensification of extreme aridity. Within this broader understanding of desert systems, sand dune systems such as the Namib Sand Sea represents a specific setting for the expression of hyperarid conditions. Other parts of the greater Namib Desert for example, the succulent ecosystem, the gravel and rock ecosystems, the Brandberg Massif, palaeontological sites, geological features and various expressions of human endeavour have their own values and attributes. At this point in time, those values and attributes have not been evaluated to the degree of developing dossiers, but only whether or not they may possess attributes of Outstanding Universal Value under the World Heritage criteria, and the degree to which they would augment the World Heritage List. That evaluation also includes rapid comparison to other desert areas, including comparison to the Namib Sand Sea. Some future nominations in the Namib Desert for inscription on the World Heritage List under criteria for nature are therefore, possible as new nominations, and not as extensions to the Namib Sand Sea.

The tentative list for Namibia already includes some locations within the greater Namib Desert such as the Welwitschia Plains and Brandberg National Monument Area, while the recent IUCN publication "*World Heritage Desert Landscapes*" (Goudie & Seely 2011) considered the inscribed site Twyfelfontein or /Ui//aes also as a Namib Desert site. Namibia's Tentative List is currently being revised, and is likely to include additional locations within the greater Namib Desert that may be considered for nomination in future as information on those locations matures. The greater Namib Desert extends into neighbouring countries, thus the tentative lists of other State Parties such as Angola and South Africa may also incorporate locations in the Namib Desert for example, the Succulent Karoo Protected Areas on the Tentative List of South Africa. Such potential future nominations would be based on attributes and values clearly different than those of the Namib Sand Sea.

4. Technical statement to confirm the rationale and process adopted to design and confirm the buffer zone for the Namib Sand Sea, including consultation undertaken with local and indigenous people in this regard

The design of the buffer zone for the Namib Sand Sea relied extensively on guidance documents produced under the auspices of the World Heritage Centre with specific reference to the Operational Guidelines, the expert meeting on buffer zones (Martin & Piatti 2009) and associated World Heritage Committee decisions, Decision 32 COM 7.1 particularly Decision 35 COM 7.1. Other resources to assist in the development of nomination dossiers such as; *Management Planning for Natural World Heritage Properties* (IUCN Protected Areas Programme 2008) and the manual for *Preparing World Heritage Nominations* (World Heritage Centre 2011) were also consulted.

The buffer zone design solicited considerable discussion within the technical team of the State Party that prepared the Namib Sand Sea nomination. The guiding principles were that: “A sensible balance therefore, needs to be struck between geographical scope and practicability (IUCN Protected Areas Programme 2008: p.22)” in applying clause 104 of the Operational Guidelines, which reads: “For the purposes of effective protection of the nominated property, a buffer zone is an area surrounding the nominated property which has complementary legal and/or customary restrictions placed on its use and development to give an added layer of protection to the property. This should include the immediate setting of the nominated property, important views and other areas or attributes that are functionally important as a support to the property and its protection. The area constituting the buffer zone should be determined in each case through appropriate mechanisms.” The technical team also acknowledged recurrent concerns of the World Heritage Committee related to buffer zones of inscribed properties, in particular, visual impacts on outstanding universal values of sites (26 of 73 cases during 31 COM) and legislative or management problems of buffer zones (16 of 73 cases during 31 COM) (data from Martin & Piatti 2009). Namibian teams attending World Heritage Committee meetings have observed that ineffective management and legislation is a recurrent theme in State of Conservation reports of large African World Heritage sites. Those realities provided the rationale for the design of an appropriate and functional buffer zone for the Namib Sand Sea within the Namibian legislative and management context.

It is against this background that the buffer zone was designed to provide additional protection, and to enhance appreciation of the values and attributes for which the Namib Sand Sea is being nominated. The core values for which the Namib Sand Sea is nominated relate to the vast expanses of loose, unconsolidated sand that comprises 84% of the nominated area. The remaining 16% consists of other substrate types interspaced with the sand sea. The primary values and attributes to be managed for the Namib Sand Sea can be summarized as follow:

- (i) **Outstanding natural beauty:** Large open spaces without perceptible scars of human intrusive activity, extraordinary clear visibility, human impact and development footprint concentrated at specific point attractions and locations, ready access for visitors to the visually most compelling and superlative sites, adaptive management to ensure that activities do not detract from appreciation of the area and the visitor experience.
- (ii) **Active geological processes of global significance:** Unimpeded natural processes of geological transport and deposition, uninterrupted flows of air and water that sculpt the geomorphology, sculpted and dissected deposits of sandstone and sediment that reflect the geological, geomorphological and palaeontological history, evidence of the effects of past climatic changes such as dead trees, river and pan sediments, coastal salt pans and isolated inselbergs.
- (iii) **On-going natural ecological dynamics that drive the evolution and interaction between resident Namib Sand Sea biota:** Extreme aridity and low net primary productivity punctuated by highly variable and unpredictable rainfall events, dominance of loose, unconsolidated sand with low clay and silt content, gradients of decreasing fog-induced moisture from west to east, persistent and reliable south-westerly coastal wind, punctuated by brief periods of variable strong winds from the east, contiguous open spaces without any barriers that allow natural expansion and contraction of populations and species ranges, periodic nutrient input through ephemeral rivers, wind or vegetation responding to unpredictable rainfall events, natural response systems of species to detect and exploit resource concentrations that are unpredictable in space and time, unimpeded integration of interactions between species complexes inhabiting different habitat types, defined by the kind of surfaces, that allows dynamic evolutionary processes and interaction between different resident communities of the Namib Sand Sea, absence of any human

activities that affect the large-scale population dynamics and interactions between resident communities.

- (iv) **Extraordinary diversity of endemic species of special significance to science and environmental understanding:** Unfragmented and pristine habitat availability along the whole range of climatic conditions that maintains the genetic diversity of species, absence of human-induced depredations on the breeding success, age and sex structure, and interactions between species, absence of alien species that can significantly change natural interactions between resident species, well documented results from on-going scientific research and long-term monitoring to explain the biodiversity, ecological relationships and fluctuations in species presence and population changes, long history of conservation management interventions to maintain ecosystem processes and manage human activities.

Evaluation of potential threats to these values and attributes illustrated that the geological, ecological and biodiversity values are essentially outside substantial human control. Management and regulation shall serve to minimize human impacts and promote appreciation of these values and their attributes within the nominated area, but are unable to affect their viability. The processes will continue and maintain themselves even in the absence of any buffer zone, as they are maintained by large-scale atmospheric and ocean processes beyond the scope of practical management intervention. Even notable sensitive attributes such as biodiversity values and attributes are robust enough not to require intensive management, as they are reiterated at a small scale on multitudes of individual dunes throughout the Namib Sand Sea. The iconic sand sea endemics evolved to cope with highly dynamic changes in loose sand and variable environmental conditions, thus human disturbances are indistinguishable from natural perturbation. Only large scale stabilization and reclamation of sand surfaces are likely to severely affect the ecology and population dynamics of Namib Sand Sea biota. Management of interspaced habitats (16% of non-sand sea surfaces) is more important, as some of their biota and geological processes are more sensitive to human activity impacts and environmental changes. Those habitats within the nominated property are very similar to habitats in the buffer zone in that they contribute to appreciation of the outstanding values of the Namib Sand Sea, but do not represent the values for which the property is nominated. Non-sand sea habitats within the nominated area contribute, however, extraordinarily to the aesthetic values for which the Namib Sand Sea is nominated. Some of these habitats such as; the eastern gravel plains,

eastern rocky areas, and ephemeral river courses (Figure 2.a.1 in Namib Sand Sea nomination dossier) are contiguous with buffer zone areas. This evaluation was encapsulated in the Namib Sand Sea nomination dossier (p. 149).

The technical analysis indicated that the most sensitive values to be managed relate to maintaining the extraordinary aesthetic landscapes of the Namib Sand Sea. As those values cannot be adequately protected by the boundaries of the nominated area itself, the buffer zone was designed to protect the setting and sense of place of the Namib Sand Sea. The primary function of the buffer zone should therefore be regarded as safeguarding the extensive and imposing views over the Namib Sand Sea and to manage human construction and activities that may affect aesthetic appreciation of the property. Practical and legislative realities suggested that management of the buffer zone should be under the same authority as for the nominated property, if it is to be conserved and protected as an integral part of the nominated property (Namib Sand Sea Management Plan). However, the buffer zone will allow more leeway for activities and infrastructure development for visitor access to different parts of the property. The conclusions of the evaluation for the buffer zones for the property follow:

4.1 The coastline (location for a western buffer zone).

The western boundary of the nominated property consists of the coastline where the land meets the South Atlantic Ocean. The marine littoral itself is controlled by the Ministry of Fisheries and Marine Resources (MFMR, Namibia), although land access is only possible with permission from the management authority. The Namib Sand Sea coastline is notoriously dangerous, without harbours, and is far removed from any shipping areas. Some fishing trawlers and survey vessels may approach the coast, but due to the rapidly shallowing sandy coastline and high energy wave action all seagoing vessels avoid coming close to the beach. The risk of a major disaster involving shipping is therefore negligible. In the wider context, the southern part of the coastline along the nominated area forms the eastern boundary of a Marine Protected Area regulated through the MFMR, thus other forms of management are in place (an area of influence *sensu* Martin & Piatti 2009). The coastline is the main source of wind-activated sand as part of the geological depositional system, but does not carry ecological or biodiversity values specific to the Namib Sand Sea. Maintaining the capacity of an ocean current to transport and deposit sand, such as the Benguela Coastal Current, is not humanly feasible. With the exception of Sandwich Harbour (a historical place name, not a shipping harbour), aesthetic appreciation of the coastline is from

the air through scenic flights. The technical team therefore, reasoned that a formal buffer zone for an area that is almost devoid of human traffic and only accessible through a permit system was not deemed necessary at this point of time. In addition, such a buffer zone would currently be impractical, as it would be outside the ability of the management authority to control. A boundary adjustment and appropriate management mechanisms will be considered, if a coastal buffer zone ever becomes necessary.

4.2 The northern and eastern buffer zones

The northern and eastern buffer zones are intended to protect and manage views towards the sand sea. The relatively narrow width reflects effective viewing distances. A wider buffer zone beyond the plains immediately adjacent to the northern (Kuseb) and eastern (inland) margins of the sand dune areas would contribute very little practical benefits for aesthetic protection, as visible appreciation of the majestic dunes decrease with distance. A small section on the north-eastern boundary of the property does not have a buffer zone. That extremity has been specifically incorporated within the nominated property, and not the buffer zone for its special views of complementary geological features and the Namib Sand Sea in the distance. It is in very rugged terrain where the landscape itself is a considerable obstacle to development. Additional protection for the landscape setting or geological features through a buffer zone was therefore, not deemed necessary. In addition, most of the land along the boundary of the eastern buffer zone (and the nominated property) is managed for tourism (Namib Sand Sea nomination dossier p. 152), and may be considered as an area of influence or informal buffer zone. The area adjacent to the northern buffer zone is part of the larger Namib-Naukluft Park and managed by the same management authority as the Namib Sand Sea and its buffer zone, thus it should also be considered an area of influence (Namib Sand Sea nomination dossier p. 153).

4.3 The southern buffer zone

The southern buffer zone includes extensive areas with majestic dunes contiguous with the Namib Sand Sea nominated area and adjacent plains areas. The sand sea component of the southern buffer zone has very similar values and attributes as the nominated property for all four criteria. However, these values and attributes are amply represented in the nominated property. The southern buffer zone was therefore, designed to allow more intrusive tourism activities and to test development initiatives. The demand for access to the sand sea for tourism is already high, and is likely to increase in the future. It is envisaged that having a large area of

the sand sea as a buffer zone with almost exactly the same values and attributes as the Namib Sand Sea nominated area, but with less stringent regulations regarding exploitation and permissible activities, may relieve some pressure from the management authority for access to the nominated area. The southern buffer zone also includes extensive vistas adjacent to the sand sea margins. An active opencast diamond mining area and its security zone along the coast, quite a distance from the nominated area, have been excluded from the southern buffer zone.

4.4 Communication and consultations undertaken with local and indigenous people

The prospective boundaries of the nominated area and its buffer zone first had to be cleared with the appropriate national authorities before any discussions could be started with regional, local and indigenous people. That is the required process in Namibia. Once provisional approval for the prospective boundaries was provided by the principal national authorities (Annex 24 Namib Sand Sea nomination dossier), the consultation process was cascaded to include regional and local authorities, the sole indigenous population directly affected by the nomination, and local freehold landowners along the eastern boundary. These consultations continue.

All people welcomed the nomination, but some expressed concerns that the consultations were delayed. The delay was beyond the control of the technical team. The State Party recognizes that some of the people who were consulted lack adequate information about the requirements for a World Heritage nomination. There were for example, misconceptions about access to natural resources in the nominated area, and the eventual legal status of an inscribed World Heritage site. Almost no comments or discussion related to the buffer zone delineation. The buffer zone itself only solicited discussion and comment from authorities responsible for various aspects of resource management, principally in what would be permissible within the buffer zone. Some of the issues that were discussed during consultations with local and indigenous people will be briefly summarized for the edification of the IUCN World Heritage Panel.

All consultations started with an information session regarding the principles and requirements for nominating a potential World Heritage site, the values and attributes for which the Namib Sand Sea is nominated, and its boundaries and management. The primary concern from stakeholders was that World Heritage status would restrict access for new tourism initiatives, that high-value natural resources such as diamonds or other minerals would become inaccessible, that national infrastructure development such as roads, railways and harbours

would be retarded, and that national sovereignty over the area would be compromised. Local communities also raised concern regarding access to direct investment by UNESCO and other international agencies and opportunities for income generation. Most of these concerns were based on perception and lack of information, but were adequately explained during the consultations, but would require on-going efforts in explaining.

As recounted already, almost no comment or concern has been received regarding the buffer zone, its extent, or its legal status. Some Individual freehold landowners have indicated an interest in extending the eastern boundary of the buffer zone during the discussions including the nominated area onto parts of their property, but not as a formal request or proposal.

Namibia currently does not have legal mechanisms to enforce compliance with some of the management requirements that would be applicable to a World Heritage site or buffer zone, while Namibia as a State Party would expect a voluntary commitment by local and indigenous communities, as a prerequisite for management of any areas within the boundaries of nominated sites and their buffer zones. Namibia has to interact with the World Heritage Committee as a State Party, thus indigenous people or individual landowners would have to agree to a mandated management authority. None of the freehold landowners have yet indicated willingness to voluntarily submit parts of their property for oversight by the management authority. At this point in time, a pilot project on co-management is being developed between the management authority and neighbouring landowners along the eastern boundary of the buffer zone, but discussions have not yet matured. It should also be taken into account that extending the eastern buffer zone would be welcome in terms of large-scale conservation, but in technical terms would contribute very little direct conservation benefits to the nominated area. It would, however, add considerable tourism value to landowners, but the degree of benefit sharing with other indigenous people in that area would be minimal.

The indigenous community resident in the buffer zone along the northern boundary regard the nomination as a positive development, as per the attached letter of support from that Community. That community has long-standing aspirations regarding their traditional areas of land-use applicable to the northern buffer zone and the outmost periphery of the nominated area. Dealing with such issues were outside the mandate of the technical team, as it is part of a much larger national dialogue. Those issues are being addressed by the management authority

through a National Policy on Protected Areas, Neighbours and Resident Communities. The management authority maintains excellent relations with that community and places a high priority on addressing community aspirations within the context of landscape and protected areas management.

5. Statement on mining in the nominated property.

The State Party hereby wishes to categorically state that there is no mining taking place in the property, and that there are no Mining Licenses allowing any mining activities at present or in the future following the specific request on the clarification regarding the mining in the property. Limited exploration work has been carried out in the past in the northern part of the property under the Exclusive Prospecting Licenses (EPLs) approved prior to developing the nomination dossier. The EPLs in question, which constitute a legal contract between the Government of Namibia and Licensees, will expire in November and December 2013 respectively (see attached map as per your request). In addition, and as per Cabinet decision of the 9th of February 2012, the Minister of Mines and Energy has been directed to withdraw the nominated World Heritage area from active prospecting. A map showing the area of the nominated property and informing the public that no license applications will be accepted for this area is displayed in the Mining Commissioner's office. Regarding the specific legal basis applicable to this particular case, please note that under Section 47(2) (a) of the Namibian Minerals (Prospecting and Mining) Act, No 33 of 1992, the Minister has clear powers to refuse to grant an application for renewal of an expired prospecting license (EPL), and is therefore, fully empowered to implement the above mentioned Cabinet decision. The Cabinet decision was also based on the legal provisions of the Namibian Minerals (Prospecting and Mining) Act, Act No. 33 of 1992.

6. Advice on the rights of indigenous communities in the nominated property.

A letter of support from the representative of the relevant indigenous people is attached, as referred to earlier.

It is important to state that Namibia has a well-developed network of protected areas that makes a major contribution to the conservation objectives contained in the country's

development goals. Protected areas in the Namibian context are created for the promotion, protection, study and preservation therein of wild animal life, wild plant life and objects of geological, ethnological, archaeological, historical and other scientific interest and for the benefit and enjoyment of the inhabitants of the country and other persons. These Protected areas are significant national assets, not only because of their contribution to GDP, but also for the physical and spiritual well-being of people living in and around them.

Namibia's protected area network makes significant contributions to the conservation of biodiversity of national and international importance and contributes to the maintenance of ecosystem services. This network delivers important socio-economic benefits to local communities who are neighbours to, and sometimes residents in protected areas. Most protected areas were established on land that in the past was occupied by indigenous people, and many park neighbours today have cultural associations with areas within the parks. However, people living in or next to protected areas often suffer losses from wildlife such as predators that kill livestock or large herbivores such as elephants that damage crops and property. Namibia considers it important to foster positive attitudes of residents and neighbours towards protected areas and capitalize on sound management with them to enhance conservation activities.

It is important to emphasize that Namibia's National Policy on Protected Areas, Neighbours and Resident Communities is consistent with the United Nations Declaration of the Rights of Indigenous Peoples. A copy of this policy is attached. The policy was developed to provide guidelines on the involvement of neighbours and resident communities in protected area management and benefit sharing, while at the same time recognizing the need to promote biodiversity conservation. The policy sets out a vision and commits the State Party to how Namibia's protected areas can contribute, not only to conservation, but also to benefit neighbours or residents of these areas and national economic development.

Specific objectives of the policy include; defining and strengthening the relationship between protected areas, neighbours and resident communities, promoting management of natural resources with protected area neighbours across larger landscapes, including Transfrontier Conservation Areas (TFCA) and Transfrontier Parks (TFP) for enhanced ecosystem conservation and socio-economic development, providing a framework for zoning of protected areas for

different land uses in order to accommodate the development needs of resident communities, creating improved communication and enhance mutual understanding between park management authorities, neighbours and resident communities, and meeting the country's national and international commitments to conservation while taking into account the rights and development needs of the people.

The Government of the Republic of Namibia engages and closely works with protected area residents and/or neighbours or other relevant stakeholders in the interests of improved conservation and promotion of national development goals, giving particular attention to promoting their socio-economic development and their involvement in the conservation, planning and development of the protected areas. This contributes to the improvement of conservation efforts of Namibia's protected areas, provides greater social equity in accessing benefits from protected areas and stimulates local economic development through creating business opportunities linked to protected areas.

In this regard, the Government of the Republic of Namibia through the Ministry of Environment and Tourism recognizes the rights of the indigenous communities within the nominated property's buffer zone.

7. References

Goudie, A. & Seely, M. 2011. World Heritage Desert Landscapes. IUCN, Gland.

IUCN Protected Areas Programme. 2008. Management Planning for Natural World Heritage Properties. IUCN, Gland.

Martin, O. & Piatti, G. (eds.) 2009. World Heritage and Buffer Zones. International Expert Meeting on World Heritage and Buffer Zones, Davos, Switzerland 11 – 14 March 2008. World Heritage Papers 25. UNESCO World Heritage Centre, Paris.

Ministry of Environment and Tourism. 2013. National Policy on Protected Areas, Neighbours and Resident Communities. Government of Namibia, Windhoek.

Seely, M. (ed.) 2012. Namib Sand Sea World Heritage Nomination. Namibia National Committee for World Heritage, Windhoek.

World Heritage Centre, 2012. Operational Guidelines. UNESCO, Paris.

World Heritage Centre. 2011. Preparing World Heritage Nominations (First Edition, 2010). UNESCO, Paris.

World Heritage Committee. 2008. Decision 32 COM 7.1

World Heritage Committee. 2011. Decision 35 COM 7.1

8. Maps

8.1 Map of Draft Management Zones for the Namib Sand Sea

8.2 Map of current Exclusive Prospecting Licences in and around the Namib Sand Sea.

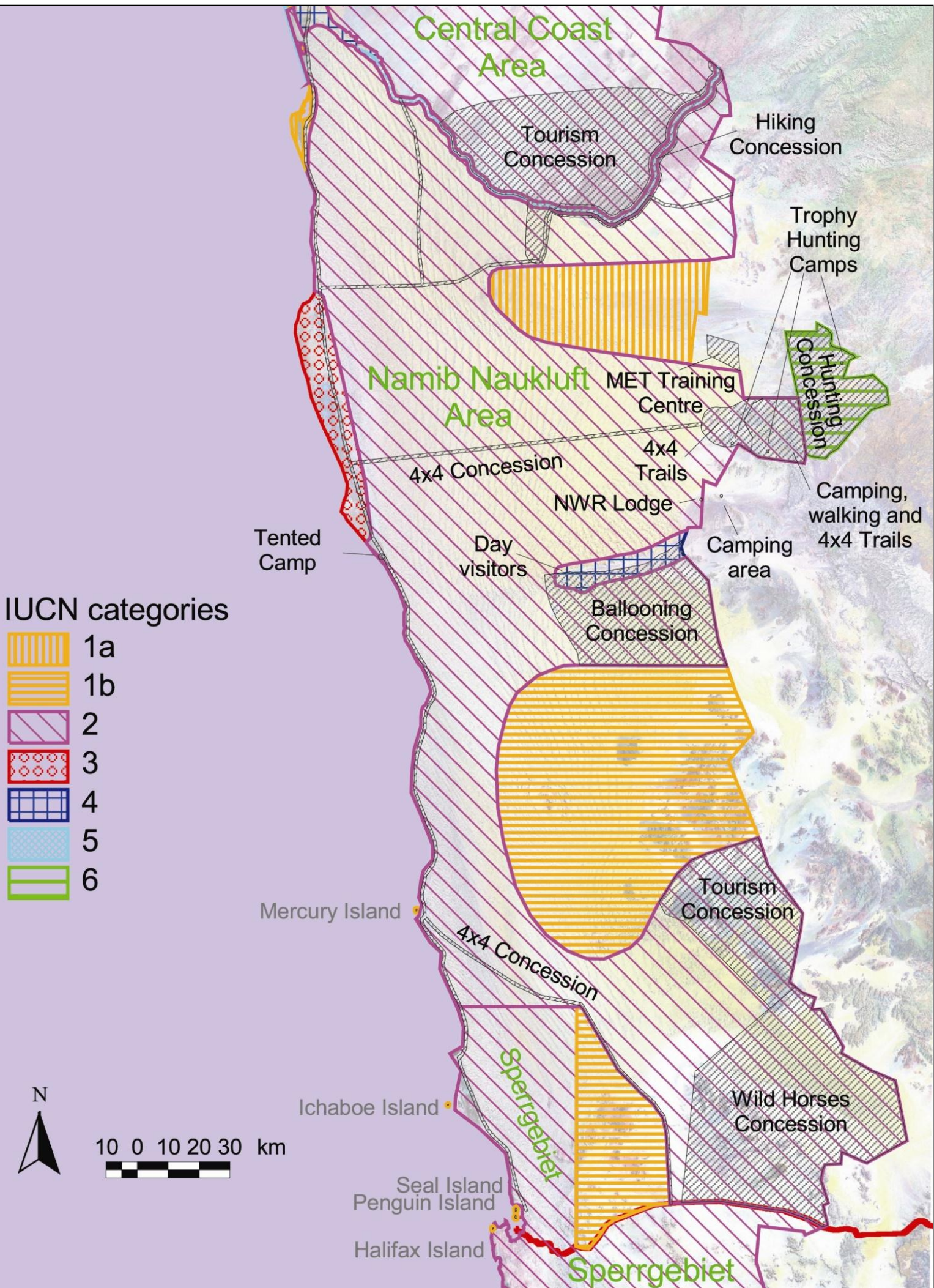
9. Annexes

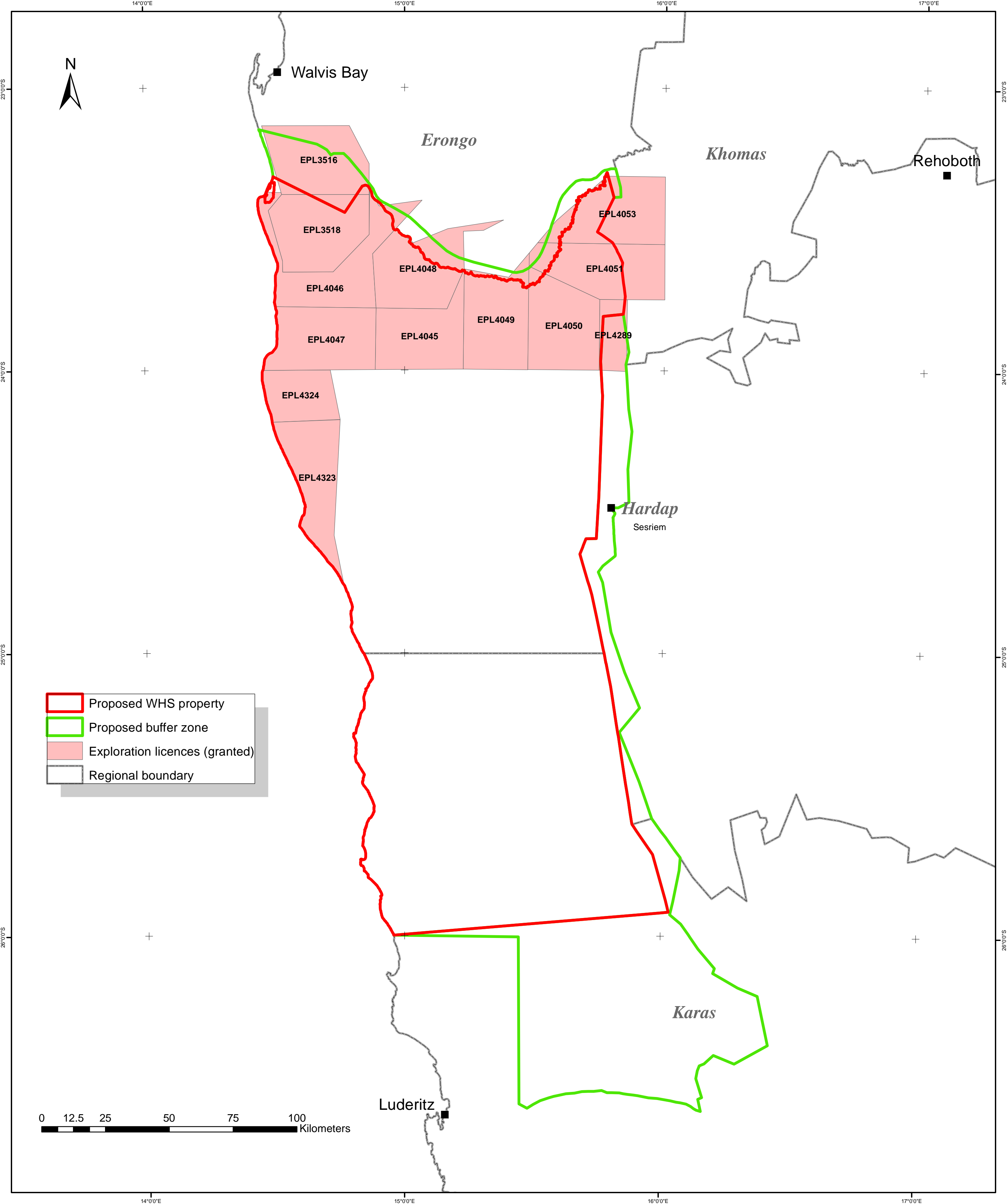
9.1 Approved Management Plans for the Namib Naukluft Park.

9.2 Namibia's National Policy on Protected Areas, Neighbours and Resident Communities.

9.3 Letter of Support for the nomination from Chief Seth Kooitjie, representative of the Topnaar indigenous peoples of Namibia.

Draft Map of Management Zones for the Namib Naukluft Park







Management Plan
for the
Namib Naukluft Park
for the period 2012-2017

20 April 2012

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Foreword

The Namib Naukluft Park contains all the elements of Namibia's western landscapes: the country's largest expanse of sand in the central Namib dune sea, wide gravel plains, a pristine coastline and a connection to the escarpment in the Naukluft Mountains. This is a conservation area of international significance, set within a larger trans-boundary landscape that covers the length of the Namib Desert in South Africa, Namibia and Angola.

The Ministry of Environment and Tourism aims to develop the Park as a world class protected desert and coastal landscape and tourism destination, that capitalizes on its scenic beauty and unique biodiversity. This is aimed to enhance both biodiversity conservation and sustainable socio-economic development for the region and the country.

Preface

Background to formulation of the Plan

This PMP was developed in a highly participatory, bottom-up way. The following steps were followed:

- An initial brainstorming meeting was held in 2008 with MET Parks & Wildlife Director, MFMR officials and the Chief Wardens of the Coastal Parks to identify key issues.
- A recent previous Namib Naukluft Park Management Plan had been developed, after extensive consultations with MET field and head office staff and other key stakeholders. This work was used as a basis for the MDP.
- Follow-up consultations were held with MET staff to clarify details.
- A two day public workshop was held in Swakopmund for all stakeholders to (a) explain and discuss the process and (b) identify key issues.
- Two public meetings were held to discuss the outcomes of the workshop and receive further inputs, in Swakopmund and Windhoek.
- A 1st draft of the MDP was prepared. This was distributed to all stakeholders involved in the workshop and meetings, and placed on a public website. Information on this website was published in the media and distributed by e-mail. All interested and affected parties were invited to review the draft MDP and provide comments – a review period of 4 weeks was provided.
- Based on some minor suggestions, a 2nd draft of the MDP was prepared and placed on the website. This was presented to a technical meeting of senior MET and MFMR staff in Windhoek.
- Another public meeting was held at the central Coast during December 2008 to fine-tune the MDP.
- Regulations were written and distributed for comment, and they were field tested during the 2008/9 summer holiday period and the 2009 Easter holiday period.
- Finally, a number of management-level meetings were held with MET and MFMR personnel during mid-2009 to ensure that consensus had been reached on all major components of the MDP.
- All comments received during the consultation process were considered in the final draft.
- The approved Management & Development Plan for the Namib Naukluft Park was formally accepted by MET in August 2009.
- A decision by MET in August 2011 to make all Park Management Plans consistent according to a set framework led to the reformulation of the MDP. Some aspects were added in the process (e.g. domestic animal management, consumptive resource utilization), but the bulk of the MDP was simply reformatted into the required format for PMPs.
- The draft Management Plan for the Namib Sand Sea World Heritage Nomination Dossier of November 2011 had to be harmonized with the overarching Namib Naukluft Park Management Plan.
- This PMP should be made widely available to all relevant stakeholders, partners and interested and affected parties.

Acknowledgements

MET sincerely thanks all the stakeholders and staff who participated in the compilation of this PMP.

Abbreviations and Acronyms

amsl – above mean sea level
BCLME – Benguela Current Large Marine Ecosystem
CF – Consultative Forum
DEA – Directorate of Environmental Affairs (in MET)
DNP – Dorob National Park
DPWMC - Directorate Parks and Wildlife Management Committee (in MET)
EIA – Environmental Impact Assessment
EMP – Environmental Management Plan
HQ - Headquarters
HW – Honorary Warden
HWC – Human – Wildlife Conflict
IBA – Important Bird Area
IPA – Important Plant Area
IUCN – World Conservation Union
KBA – Key Biodiversity Area
LA – Local Authority
MC - Management Committee
MDP – Management and Development Plan
MET – Ministry of Environment and Tourism
MFMR – Ministry of Fisheries and Marine Resources
MWTC – Ministry of Works, Transport and Communication
NAMPORT – Namibian Port Authority
NAMPOL – Namibian Police
NGO – Non Governmental Organisation
NNP – Namib Naukluft Park
ORV – Offroad Vehicle
PCF – Park Consultative Forum
PRDC - Policy Research and Development Committee
SF – Strategic Forum
SMP - Strategic Management Plan
SNP - Sperrgebiet National Park
SEA – Strategic Environmental Assessment
TORs – Terms of Reference

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1. Overview of the Namib Naukluft Park

1.1. Context of Namibia's Coastal Parks

The Coastal Parks of Namibia stretch along the entire Namibian coastline, a distance of about 1,570 km, from the Orange River in the south to the Kunene River in the north (Figure 1). The Coastal Parks comprises four main Protected Areas: the Sperrgebiet National Park in the south, the Namib Naukluft Park, Dorob National Park and the Skeleton Coast National Park. At its narrowest point in the Skeleton Coast, the Park extends about 25 km inland, while at its widest in the Naukluft area it extends inland about 180 km to the top of the escarpment. Namibia is the only continental country in the world that has its entire coastline protected as a national park.

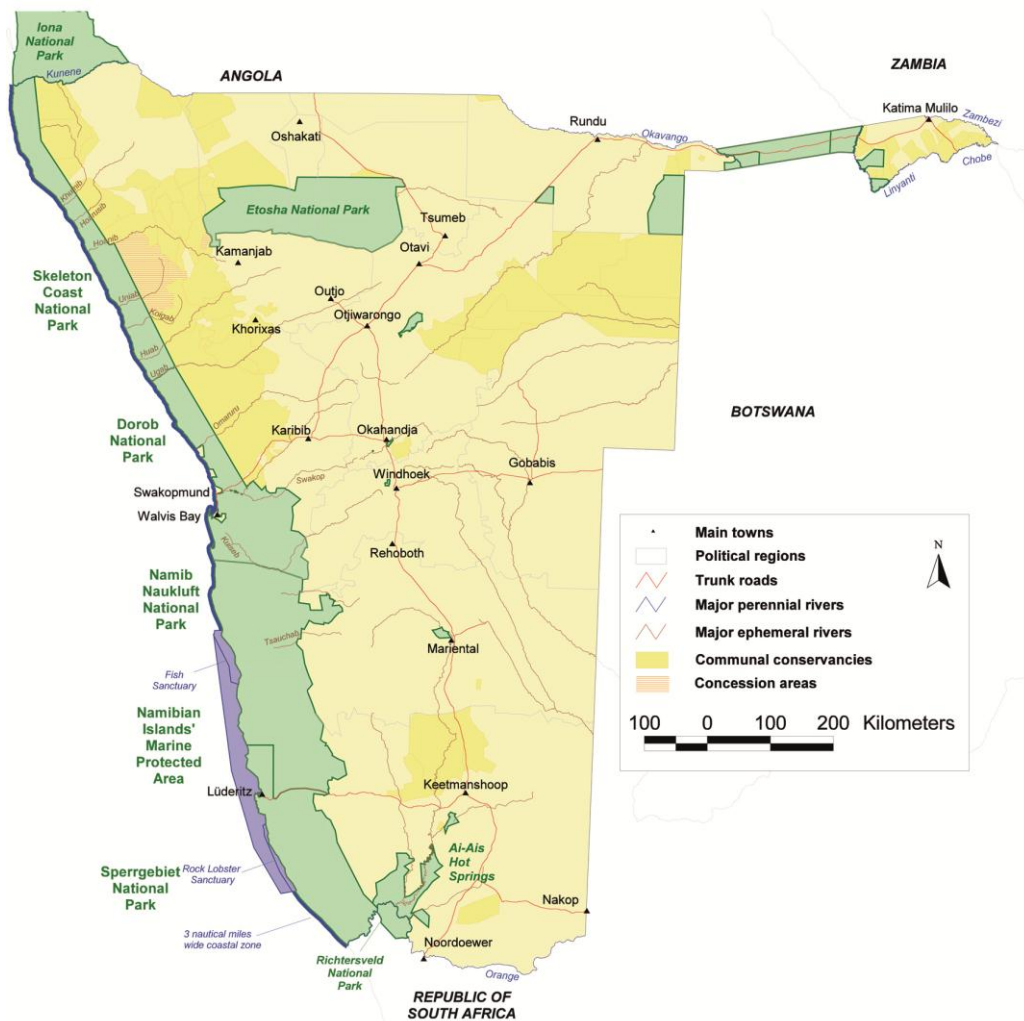


Figure 1: The Protected Areas of Namibia showing the four Coastal Parks, the Marine Protected Area and the contiguous areas of land under different forms of conservation (e.g. National Parks in Angola, Namibia and South Africa, communal Conservancies and wildlife & tourism Concessions).

The Coastal Parks together make up the 8th largest protected area in the world, the 6th largest terrestrial protected area and the largest park complex

in Africa (see Table 1), covering an area of 10.754 million hectares, or 107,540 km².

Table 1: The 10 largest protected areas in the world.

No.	Name	Ecosystem	Country	Size (ha)
1	Greenland's National Park	Terrestrial and coastal; Arctic island	Greenland	97,200,000
2	Ar-Rub'al-Khali Wildlife Management Area	Terrestrial; Desert	Saudi Arabia	64,000,000
3	Great Barrier Reef Marine Park	Marine & coastal	Australia	34,500,000
4	Northwestern Hawaiian Islands' Coral Reef Ecosystem Reserve	Marine & coastal	United States of America	34,000,000
5	Amazonia Forest Reserve	Terrestrial; Tropical rain forest	Colombia	32,000,000
6	Qiang Tang Nature Reserve	Terrestrial; Alpine Tibetan plateau grasslands	China	25,000,000
7	Cape Churchill Wildlife Management Area	Terrestrial; intertidal & marine	Canada	14,000,000
8	Skeleton Coast-Dorob-Namib Naukluft-Sperrgebiet National Parks	Terrestrial & coastal; Desert ecosystems	Namibia	10,754,000
9	Northern Wildlife Management Zone	Terrestrial; Desert	Saudi Arabia	10,000,000
10	Alto Orinoco-Casiquiare Biosphere Reserve	Terrestrial; tropical rain forest	Venezuela and Bolivia	8,000,000

However, the Coastal Parks do not exist in isolation. In the south across the Orange River the Sperrgebiet NP borders on the Richtersveld in South Africa, which comprises a protected area of about 160,000 ha within a multiple use buffer zone of about 398,425 ha. This whole area forms the Ai-Ais/Richtersveld Transfrontier Conservation Area (TFCA) under a formal cooperative Agreement between the Governments of Namibia and South Africa.

To the north across the Kunene River the Skeleton Coast NP joins the Iona National Park in Angola, which covers about 585,000 ha. The Governments of Namibia and Angola have signed an Agreement to promote transfrontier cooperation between these parks.

In Namibia the Coastal Parks are contiguous with a large number of protected areas, concessions, conservancies and private land managed for conservation. These are shown in Table 2. Most notable amongst these are the following:

- Coastal and Marine Protected Area off the Sperrgebiet and Namib Naukluft areas, running for 400 km up the coast and about 30 km wide, covering an area of 1.2 million ha and containing all of Namibia’s islands;
- Ai-Ais/Fish River Canyon National Park which in turn borders on private protected areas;
- Contiguous with 20 communal conservancies and three wildlife and tourism concession areas, and via them linked to the Etosha National Park (2.29 million ha) and thence to further communal and private conservation areas;
- Borders on at least 2 million ha of freehold conservancies and private protected areas.

Table 2: Contiguous conservation areas with Namibia’s Coastal Parks

Country	Name / Tenure	Area (ha)
South Africa	Richtersveld and buffer area / communal (RSA Parks)	558,425
Angola	Iona National Park / state	585,000
Namibia	Communal conservancies	6,235,500
	Wildlife & tourism Concessions	800,000
	Freehold conservancies and private protected areas	2,050,000
	State Parks (Ministry of Environment & Tourism)	2,651,200
	Marine Protected Area (Ministry of Fisheries & Marine Resources)	1,200,000
TOTAL		14,080,125

(Note that the extent of land under conservation, particularly private land, is constantly changing (increasing) and that, because there is no registration mechanism for private protected areas and game farms, this figure represents an absolute minimum area.)

In total the Coastal Parks border onto over 14 million ha of land that is managed primarily for wildlife, biodiversity, conservation and tourism. Together with the parks, this represents a contiguous area of almost 25 million ha. One of the greatest challenges with potentially the greatest rewards is to develop effective, constructive and efficient co-management mechanisms across these land- and seascapes to optimize both the environmental (including biodiversity) and socio-economic values, while at the same time using these open systems to (a) allow the historic movement and migration patterns of wildlife in response to the highly variable climatic conditions to become re-established, (b) mitigate and buffer the impacts of climate change and thereby make the area more resilient to change, and (c) create incentives for neighbouring land owners and custodians to become part of this conservation landscape, thereby further strengthening the area’s contributions to socio-economic development and environmental conservation.

The proclamation of this protected area represents one of Namibia’s greatest conservation achievements since gaining Independence in 1990, and one of the most exciting developments in the history of conservation in this country.

1.2. Geographic features of the Namib Naukluft Park

The Namib Naukluft Park extends from the Hardap-Erongo regional boundary in the north (and bordering onto the Dorob National Park) to the northern border of the Sperrgebiet in the south, formed by the main road to Luderitz but 20 km short of Luderitz extending due north for about 80 km and then due west to reach the coast at Gibraltar. To the west it borders on the Atlantic Ocean and to the east on freehold farmlands (Figure 1).

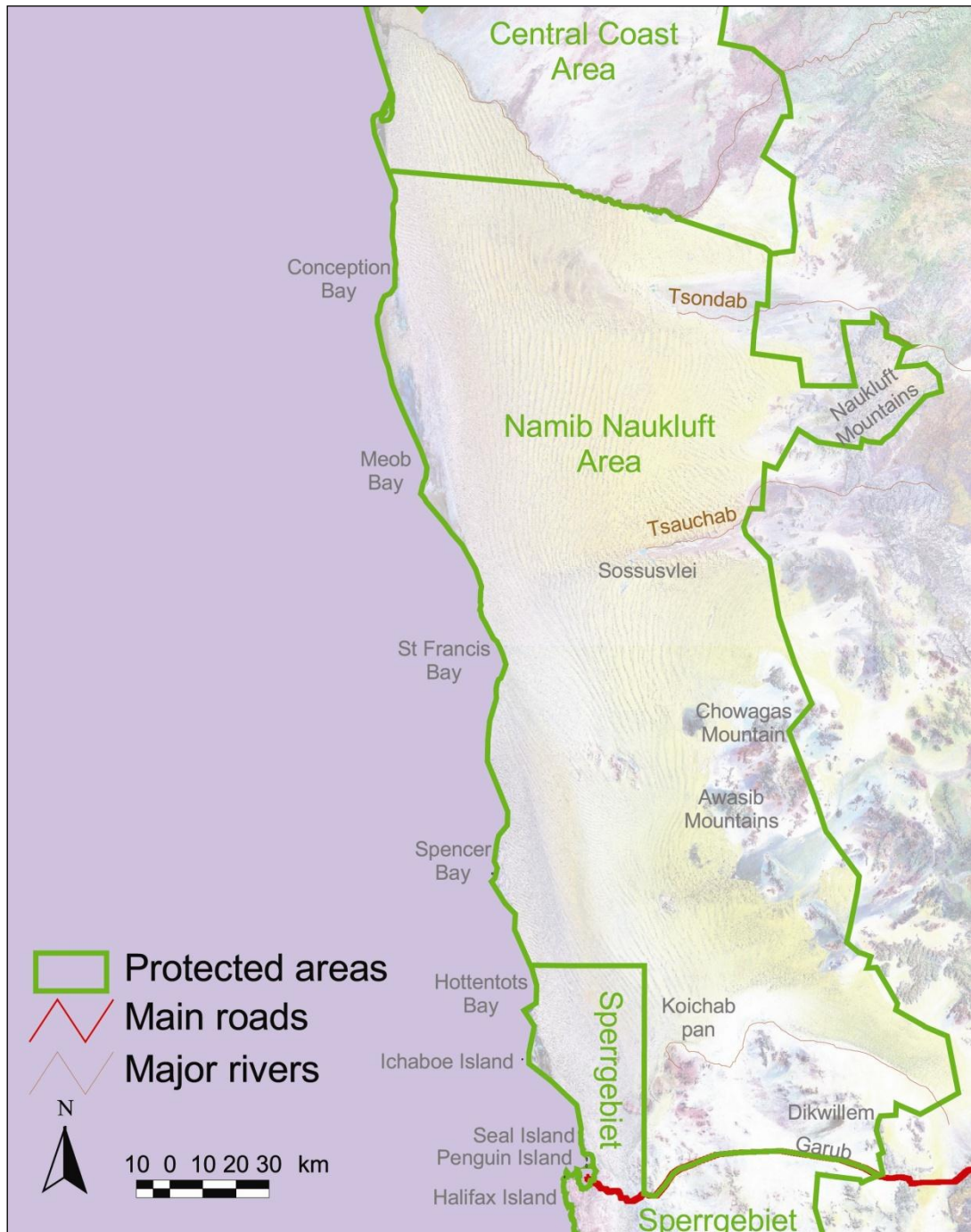


Figure 2: The Namib Naukluft Park

1.2.1. Climate

The Namib Naukluft Park (NNP) occupies some of the most arid lands in Africa south of the Sahara. The whole park falls below the 100 mm median annual rainfall isohyet and much of it below the 50 mm isohyet. In addition to the extremely low annual rainfall it is also hugely variable with an annual coefficient of variation ranging typically from 80% to over 100%. With its high evaporation rates and low rainfall, NNP experiences an average water deficit of about 2 m per year. Rain falls mainly from January to March.

The climate of the Namib Desert is influenced mainly by the cold Benguela Current and the South Atlantic Anticyclone. Temperatures are generally moderate (average minimum and maximum temperatures during the coldest and hottest months respectively reflecting a range of about 7-32°C), fog is frequent (about 125 days per year on the coast dropping to about 40 days per year 80 km inland) and wind is a dominant feature. These winds are mainly from the south and drive the Benguela Current northwards, carry sand from the shore onto the adjacent land, and cause upwellings along the coast which bring nutrient-rich waters to the surface.

It is important to understand why the Namib is a desert. First, the cold waters of the Benguela Current cool the air so much that it cannot rise up and develop into large rain-bearing clouds. The sea air remains trapped in a layer from the sea to about 600 m above sea level. Moisture from the sea is seen only as low clouds and fog. Second, moist tropical air from the east and north has usually shed its moisture before reaching the Namib coastal areas. And even when rain-bearing clouds do approach, they are usually blocked by breezes from the sea which blow inland for some distance, often to the escarpment. And finally, any moist tropical air blowing towards the desert descends over the escarpment, warming and drying out as it sinks down. These factors all combine to make rainfall an unusual event in the Namib.

1.2.2. Biomes

The NNP falls within the Southern Namib hyper-arid Desert and Coastal Biomes, with the Naukluft extending to above the escarpment into the Desert-Dwarf Shrub Transition of the Nama Karoo Biome. These biomes contain a number of different vegetation types and an even greater number of habitats, described in Section 2.1.

1.2.3. Important features

The NNP contains a large number of globally significant features. The following are perhaps the most notable:

- About 280 km of coastline, mainly sandy shores, with a number of bays often associated with rocky outcrops or bluffs, and coastal salt flats, with Damara Terns favouring the last mentioned as breeding sites.

- The central Namib gravel plains with inselbergs, that support plains wildlife such as oryx, springbok and ostrich.
- A continuous sand sea of dunes and sandy plains covering some 4 million ha, almost the entire area. The sand sea is presently being nominated as a World Heritage Site.
- Three ephemeral endorheic river systems that end in pans amongst the dunes – Tsondabvlei in the north, Sossusvlei near the centre and Koichab Pan in the south.
- The Naukluft Mountains which rise from the desert plains at 400-500 m amsl to almost 2,000 m, forming near vertical escarpments and deeply incised valleys.
- A vast array of dramatic landscapes and scenery, and a huge sense of wilderness, novel to most visitors and highly accessible compared to most extreme desert ecosystems.
- This Park also contains a suite of uniquely adapted organisms to desert conditions, including endemic plants birds, reptiles and invertebrates.
- Sandwich Harbour specifically, and in fact the entire Park, is designated an Important Bird Area (IBA), and it also qualifies as a Key Biodiversity Area (KBA).
- Two Important Plant Areas (IPAs) occur in the NNP: the Naukluft and the south eastern corner incorporating the Dikwillem range, which support a rich succulent plant community.
- The southern part of the NNP borders on a Marine Protected Area that includes the near inshore Mercury Island, a designated IBA.

1.3. Purpose of the Park Management Plan

The main purposes of the PMP are as follows (MET 2011):

- To document all relevant information, including historical, biodiversity, archaeological and social context which is relevant for the park.
- To describe the general characteristics of the ecosystems contained within the park, as well as the regional biodiversity context within which the park is located.
- To guide staff and stakeholders of the Ministry of Environment and Tourism on how a specific park should be developed and managed.
- To assist the Ministry of Environment and Tourism in setting priorities during planning.
- To form part of a monitoring and evaluation system that provides the basis for determining whether goals, objectives and strategies specified in the Ministry of Environment and Tourism Strategic Plan and National Development Plans are achieved.
- To ensure that the park contributes to sustainable utilization of natural resources and socio-economic development.

The plan for this Park has been designed and structured to be priority focused and action orientated, to facilitate implementation and the achievement of outputs and outcomes. The plan is linked to an annual cycle of management and oversight, involving the preparation of annual work plans, budgets, reporting and two levels of Park oversight – a Strategic Forum and a Consultative Forum.

The plan is “principles” based. These principles serve essentially as mini policy statements. Not all eventualities can be planned for, but if the basic principles are established, decisions can be readily made against these principles and thus be in line with Park policy.

The plan is designed around a uniform structure for easy reference and use, and the language is kept simple for broad accessibility.

The plan should be used in conjunction with Park legislation and regulations, as well as with other relevant literature on the area. No superfluous or duplicate information is provided in the plan. A reference list of the more significant publications and reports on the area is contained in the Bibliography.

1.4. Objectives of the Park Management Plan

The over-arching mission of MET is “to promote biodiversity conservation in the Namibian environment through the sustainable utilization of natural resources and tourism development for the maximum social and economic benefit of its citizens.”

1.4.1. Vision for the Namib Naukluft Park Management Plan

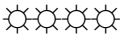


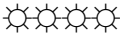

To develop the NNA, as a world class Protected Desert and coastal Landscape and Tourism destination that capitalizes on its sand sea, remote coastline, escarpment, wilderness and scenery, and its pro-conservation neighbours, to enhance both biodiversity conservation and sustainable socio-economic development for the region and country, within a larger co-managed tri-nation transboundary landscape of global renown working to become a World Heritage Site.

1.4.2. Goal

To wisely manage, protect and strategically develop the land and natural resources of the NNP within a “world class Protected Desert and Coastal Landscape and Tourism destination” of globally significant biodiversity, scenery and wilderness under the brand “Desert Discovery”. Secondly, to achieve a balance between protection and tourism that maintains a complete “sense of place”, remoteness and wilderness while significantly increasing the NNP’s contributions to Namibia’s regional and national economic development objectives.

1.4.3. Objectives

- ❖ To conserve and wisely manage the landscapes, ecosystems and biological diversity of the NNP with particular attention to areas of high biodiversity, scenic and wilderness values, fragility and tourism pressure and, where necessary, to restore and rehabilitate degraded systems to their natural and productive states.
- ❖ To manage biodiversity and ecosystems as may be necessary and appropriate to maintain optimal biological diversity, ecosystem stability and resilience under highly variable and globally changing climatic conditions, to manage for open co-managed landscapes and to reintroduce and rebuild populations of plants and animals indigenous to the area within historic times, as appropriate under current and changing conditions.
- ❖ To promote and support appropriate land and natural resource uses that are compatible with the above objectives, including appropriate levels of protection, tourism development and activities, consumptive and non-consumptive utilisation, research, environmental education, awareness and outreach initiatives, and to strive to instill in residents and visitors to the area its high environmental values and unique character which should be harnessed in sustainable ways to ensure its financial viability without compromising on sound conservation principles and practices.
- ❖ To significantly increase the contributions of the NNP to Namibia's social and economic development objectives at local, regional and national levels, through appropriate uses of the area that are in harmony with its ecological objectives.
- ❖ To build coalitions, establish partnerships and co-management approaches with citizens, neighbours, NGOs, businesses and other government institutions for focal and landscape level conservation, law enforcement, socio-economic development, marketing, awareness creation and education, monitoring and research and strategic planning and development, to enhance the diversity, viability and competitiveness of the NNP within the context of the Coastal Parks, Namibia and southern Africa.
- ❖ To demonstrate the ecological, social and economic viability, sustainability and competitiveness of integrated and carefully zoned land uses and management, with an emphasis on conservation and tourism-based enterprises where relatively high human pressures occur in hyper-arid coastal areas.
- ❖ To seamlessly link the NNP with the other Coastal Parks, and with emerging and future Coastal & Marine Protected Areas, under a management and marketing umbrella that expands to an ecosystems and landscape co-management approach with compatible neighbours and works towards creating a World Heritage Site between the Orange and Kunene Rivers (and beyond).

	and “vleis”		rivers in the dunes, providing high scenic and biodiversity values. Sossusvlei has been subject to large tourism development and pressure, while Koichab Pan is an important source of water to Luderitz. Tsondabvlei is designated as a highly sensitive zone and must be carefully protected.
	Inselbergs		Important from archeological, biodiversity and aesthetic perspectives.
	Inland rocky hills		Less sensitive than inselbergs, but nonetheless important for biodiversity and refugia for plants and animals, particularly during dry periods
	Naukluft escarpment		Scenic value and important for cliff-nesting birds and cliff-loving plants
	Naukluft incised valleys and wetlands		Rich and highly unusual ecosystems, often containing pools of water throughout the year and providing this essential resource to plants, birds, mammals and insects.
	Naukluft Plateau		The only part of the Namibia escarpment that is in a State protected area, and therefore requiring high levels of protection.

2.1.2. Principle

The comprehensive diversity of landscapes, habitats, plants and animals indigenous to the NNP are protected and both ecosystem functioning and natural evolutionary processes take place effectively.

2.1.3. Vision

To protect and conserve the diversity of “sense of place”, landscapes, habitats and biota of the NNP in healthy and productive condition within the context of the Greater Namib Area.

2.1.4. Strategies

- a) Because of the large open systems involved, and the intention to create linkages with adjacent ecosystems (e.g. coastal and marine to west and escarpment belt to east), ecosystem management should be minimal, and a largely hands-off approach should be

adopted, but „hands-on“ in terms of forging strategic partnerships for open landscape co-management and to prevent and/or minimizing damage to important habitats and species in the NNP.

- b) Should it become necessary to apply active management, interventions should aim to manage the arid ecosystems for long-term diversity, health, productivity and climate change resilience and adaptation, by ensuring connectivity, preventing over use of all components, including water, fauna and flora, landscapes, etc.
- c) Allow and promote variability in management and “patchiness” in ecosystem expression in response to variable climatic conditions and ecosystem functioning.
- d) Build up a good monitoring record of ecological and bio-climatic information, including the diversity and abundance of various species in different taxa, including the less studied lower plants, invertebrates, etc.
- e) Monitor the health of populations of species high on the food chain (e.g. key predators and scavengers), flagship and keystone species and other strategic key indicator species (including indicator species for early warning of climate change impacts) – if these species prosper it follows that the base of the food chain is likely to be diverse and in good condition.
- f) Monitor key habitats such as Important Bird Areas and Important Plant Areas.
- g) Monitor human impacts on landscapes, ecosystems, habitats and species with particular attention to fragile and high value components of the system, and human activities known to have significant impacts.
- h) Participatory and outsourced approaches for monitoring should be used, fully involving relevant stakeholders.
- i) No poisons or pesticides (or other toxic chemicals) may be used in the park.

2.1.5. Activities

Actions	Timing	Record of progress
1. Set up (where necessary), implement and support monitoring systems for ecosystem health, key habitats, and biodiversity building on existing systems used elsewhere (e.g. Event Book system) and continuing with long-term data series (e.g. wetland bird counts)	During 2012	
2. Identify priority baseline information needs	During 2012	
3. Set up, implement and support monitoring systems for human impacts on important	During 2014	

components of the Park		
4. Review and fine tune habitat categories	By end 2014	
5. Prepare poster for staff, residents and visitors on the habitats (land forms and vegetation types) of the NNP, with photographs and sensitivity ratings	By mid 2014	
6. Ensure that no toxic substances, poisons or pesticides are used in the Park	Now and onwards	

The following components are subsets of the Biodiversity Conservation category, and provide more details on specific components.

2.1a Sandwich Harbour Ramsar Site

Principle

This wetland area of international significance, with high numbers of wetland birds, including Red Data species, should be afforded the highest level of protection that legislation, zonation and management practices can provide.

Vision

To protect, monitor, understand, manage and conserve the Sandwich Harbour Ramsar sites, and their ecosystem functioning, with particular attention to the wetland birds which serve as sensitive indicators to the health of the system.

Strategies

- a) Strictly implement and enforce the zonation rules and regulations for the Sandwich Harbour wetland.
- b) Ensure that co-management partners and Honorary Wardens are specifically empowered to assist MET and MFMR to help implement and enforce zonation rules and regulations for the Sandwich Harbour wetland.
- c) Ensure that long-term monitoring of the health of these wetlands continues, using bird counts, water quality and other appropriate means, and via participatory and outsourced mechanisms.
- d) Establish an early warning system to mobilize appropriate action in the event of problems being identified, either through monitoring or from incidental information.
- e) Disseminate information on the ecological and socio-economic values of these wetlands to local residents (particularly via schools), visitors, decision-makers and to the general public.

Activities:

Actions	Timing	Record of progress
Apply strict enforcement of zonation rules and regulations for the Sandwich Harbour wetland	2012 and ongoing	

Engage pro-actively with partners to help establish a strong support and information base for the custodianship of these wetlands, and appoint a suite of Honorary Wardens to help enforce rules and regulations	2013 and ongoing	
Provide good quality information boards in appropriate locations around the wetlands, including information on zonation, regulations and the roles and authority of Honorary Wardens. Also provide a HotLine telephone number for the public to report people who violate the regulations.	2013 and ongoing	
Ensure that regular monitoring of the health of the wetlands is undertaken. Where existing monitoring is being undertaken by partner organizations (e.g. bird counts), support them to continue this working. Where new monitoring parameters are deemed necessary (e.g. water quality), seek to collect and analyse such data via participatory and partnership approaches. All resulting data and information must be in the public domain.	2013 and ongoing	
Disseminate information on a regular basis to local residents, schools, visitors, decision-makers and the general public.	ongoing	

2.2. Fire

Fire is not a significant part of the Namib-Naukluft ecological dynamics, and is not addressed in the management plan.

2.3. Rehabilitation

2.3.1. Principle

Natural landscapes and biodiversity are, as far as possible and practical, reestablished to their pristine condition or in line with agreed future land use.

2.3.2. Vision

To remove all unnecessary evidence of human occupation from the Park, except agreed infrastructure e.g. Topnaar settlements, and impacts in designated sites such as approved “sacrifice areas”, and to rehabilitate

landscapes and biodiversity, using best available practices, with emphasis on those areas of greatest ecological and aesthetic importance.

2.3.3. Strategies:

- a) Commission a rehabilitation plan based on an inventory and criteria (log of areas, prioritization, costs and timelines) for the NNP.
- b) Identify responsibilities for rehabilitation – both technical and financial responsibilities.
- c) MET and other relevant parties, including designated organizations entrusted or employed to do this work, to systematically implement rehabilitation in areas and on aspects of respective responsibilities, to agreed standards and levels, starting with the affordable priorities.

2.3.4. Activities

Actions	Timing	Record of progress
Commission a rehabilitation plan	Start in 2014	
Identify responsibilities for rehabilitation	Completed during 2014	
Implement rehabilitation in areas and on aspects of respective responsibilities, starting with the affordable priorities and using job-creating opportunities where possible.	2015 and ongoing	

2.4. Wildlife population management

2.4.1. Principle

A rich diversity of indigenous wildlife prospers within an open, dynamic and resilient ecosystem.

2.4.2. Vision

Wildlife population numbers will be managed, mainly through self-regulation, at levels where biomass carrying capacity is considered conservatively appropriate and sustainable, per species and for the total wildlife population, under different rainfall and range conditions. Mass mortalities during droughts will be avoided – mainly by working to establish open systems, particularly west-east. Population fluctuations due to good breeding and slow attrition during wet and dry cycles, and from predation, will not be cause for concern.

Trophy hunting, under carefully controlled conditions, based on population census data and very conservative quotas will be permitted only in a selected area of the Naukluft mountains and for approved ungulate species that are not considered to be threatened. Live capture for conservation purposes such as population reduction and special reintroduction elsewhere will be permitted.

2.4.3. Strategies

a) Population trends, health (age and sex structures and body condition) and distribution of populations will be monitored as necessary, as part of the coastal parks" monitoring process.

b) Wildlife management decisions will be taken in an adaptive manner, with a minimalist intervention philosophy, and based on good monitoring and research information, as may be decided from time to time.

2.4.4. Activities

Actions	Timing	Record of progress
Design and implement integrated monitoring systems for rainfall, vegetation condition (particularly in vicinity of artificial water points) and wildlife (numbers, age & sex classes and condition), making use of the "Event Book" system	Design during 2014, implementation thereafter and ongoing	
Obtain and document historic information on wildlife diversity, numbers, extinctions and other relevant issue.	2014	
Proactively review information on key variables to determine if any management actions are necessary, and identify management options	Systems set up and tested starting 2015 and then ongoing	
Adaptively manage wildlife using a minimalist intervention approach and most relevant practices	As necessary	

2.5. Wildlife introductions

2.5.1. Principle

The historic diversity of wildlife and their full suite of interactions are reinstated, as far as is practically possible under prevailing conditions.

2.5.2. Vision

To re-introduce and/or augment as appropriate species that were locally indigenous within historic times provided these have a reasonable chance of survival under current conditions and are practically and socially acceptable.

2.5.3. Strategies:

a) Carry out an assessment of species that historically occurred in the NNP.

- b) Review which species that no longer occur, or occur at below optimal numbers, could be re-introduced under current conditions, and prepare a prioritized list.
- c) Be mindful that the NNP is on the extreme western edge of a number of species' ranges. In higher rainfall years such species may/would have moved westwards into the NNP, and in lower rainfall years they would have retreated eastwards into the escarpment. Once large, open areas have been secured, reintroductions into the greater area may be viable, but which would not be so if confined to the NNP. Thus take a larger picture view of wildlife reintroductions, and be mindful of the linear oases provided by the Swakop and Kuiseb Rivers crossing the Namib Desert.
- d) Introduce wildlife in phases as per the list, and subject to rainfall and veld condition being adequate to enhance survival chances.
- e) Acquire wildlife from similar habitats (e.g. Namib and Karoo Transition ecosystem) for genetic integrity and optimal chances of success.
- f) Introduce wildlife in sufficient numbers to be viable, rather than having small token introductions.
- g) Where species are likely to recolonise or to augment existing populations by in-migration, allow this to happen rather than active reintroduction.
- h) No species exotic to the NNP will be introduced.
- i) No subspecies or components of populations from elsewhere will be introduced if there is any risk of genetic pollution to the indigenous populations' genetic integrity, and where suitable animals can be acquired from within the required gene pool.
- j) In the case of introductions that have a potential impact on residents and communities within and adjacent to the NNP, full consultations will take place prior to any introductions.

2.5.4. Activities

Actions	Timing	Record of progress
Carry out an assessment of historic distributions of wildlife in the NNP and adjacent areas of the Coastal Parks.	2015	
Based on the above and present-day viability and acceptability, develop and implement a phased reintroduction and augmentation plan (e.g. giraffe in the Kuiseb River, red hartebeest in the Naukluft).	2015 and ongoing	
Monitor introduced and augmented populations – numbers, breeding, sex and age ratios, distribution, etc.	From each introduction and ongoing	

2.6. Water points and water management

2.6.1. Principle

A minimalist, ecologically appropriate and tourism friendly water plan is implemented, taking into account neighbouring land use and water provision.

2.6.2. Vision

The provision of water for wildlife will be undertaken strategically in the interests of maintaining biological diversity in a fenced ecosystem. Emphasis will be placed on securing open systems and corridors in west-east and north-south directions, to facilitate natural ecological processes and reinstating historic movement patterns. Water use for other purposes will be judicious, minimalist and based on environmental assessment principles.

2.6.3. Strategies:

- a) Water point development and management will be on a strategic basis – the default setting is a minimalist provision of water.
- b) In a critical situation, e.g. wildlife building up along fenced eastern boundary in times of extreme drought, then temporary water provision may be availed if considered absolutely necessary.
- c) The park-neighbour policy and strategy will be energetically pursued to explore partnerships to the east, removal of fences and the opening up of west-east corridors with landowners that share compatible values and land-uses with those of the park.
- d) All natural water points will be carefully managed to avoid disturbance and degradation, and an appropriate monitoring system will be established.
- e) Abstraction of groundwater from the NNP, and in adjacent areas, will be carefully monitored, both the volumes abstracted and impacts on the environment, and adaptively managed.
- f) Use of water for tourism, mining and other purposes must be judicious, minimalist, demand managed and monitored. Sustainable sources of water must be used. No unsustainable extraction will take place or any extraction that may have negative biodiversity impacts.

2.6.4. Activities

Actions	Timing	Record of progress
Create a map and inventory of all natural water points as well as boreholes & infrastructure, together with their attributes, such as yield, depth and water quality	2013	
Ensure that all natural water points remain undisturbed, with low level monitoring	Ongoing	
All bulk water abstraction projects must be preceded by an EIA. The default setting is no bulk water abstraction should be allowed in the	Ongoing	

NNP.		
Good water demand management practices and monitoring should be implemented for water use in the NNP and throughout the Coastal Parks.	Ongoing	

2.7. Domestic animal management

2.7.1. Principle

No domestic pets are allowed in the Park. Livestock such as donkeys, goats and cattle belonging to Topnaars resident in the Park are allowed to be kept provided that they personally belong to people who are resident in the Park, and their numbers are kept within the carrying capacity of the area. Livestock are not allowed in signposted exclusion areas.

2.7.2. Vision

MET accepts that keeping livestock is part of the natural tradition and livelihood of Topnaar people along the Kuiseb river bed. Livestock are therefore allowed to be kept, as long as they do not cause long-term deterioration of the vegetation.

2.7.3. Strategies:

- a) Water provision for livestock should only be allowed at places where Topnaar residents live, to keep these animals relatively close to their owners.
- b) Total numbers of animals should not exceed the carrying capacity of the area and time of year.
- c) Animals that become feral or that are unattended by Topnaar residents should be removed from the Park.

2.7.4. Activities

Actions	Timing	Record of progress
Park staff and Honorary Wardens, during the course of their patrols, should be alert for livestock that are not under appropriate control as stated in 2.7.3 above. If problem animals are encountered, the officials should ensure that the animals are removed / trapped.	Ongoing	
Carrying capacity of the area, with particular reference to Large and Small Stock Units (LSUs and SSUs), should be determined for the lower Kuiseb area, and revised on an annual basis.	Annual survey	

2.8. Fencing

2.8.1. Principle

Open systems should be maintained for the largest possible landscape integrity, both within and beyond the NNP and the Coastal Parks.

2.8.2. Vision

All internal fences except those that have strategic value (e.g. security fencing around lichen fields or refuse dumps, etc) are removed.

Boundary fences will be removed or breached where neighboring land-use is compatible and where joint venture / co-management agreements have been secured.

Where neighboring land use and/or security is a threat to the park's integrity, or where secure fencing is essential for good neighbourliness (e.g. to protect neighbouring small stock farmers from predators), boundary fences will be secured and well maintained.

2.8.3. Strategies

- a) Maintain and secure fencing (cable fence) around key lichen fields and other approved sites.
- b) Boundary fences (on the east border of the NNP), where security is of concern and where neighbours practice incompatible land uses, should be strengthened, monitored and maintained.
- c) Negotiate with potentially sympathetic neighbours who practice compatible land uses on boundary fence removals/ breechings and cross-boundary co-management (e.g. joint monitoring, surveillance, law enforcement).

2.8.4. Activities

Actions	Timing	Record of progress
1. Maintain and establish cable fencing around all key lichen fields and other approved sites.	Ongoing	
2. Patrol & maintain fences as appropriate where security is of concern and with incompatible neighbours	2012 and ongoing	
3. Negotiate with sympathetic neighbours for boundary fence removal/breeching	2014 and ongoing	

2.9. Human wildlife conflict management

2.9.1. Principle

The NNP harbours a few species (leopard, cheetah, possibly others such as rhino in future) that may damage property and threaten the safety of livestock and people living in neighbouring areas. Individual animals that cause conflict must be dealt with according to the National Policy on Human Wildlife Conflict Management and agreements with the respective neighbours .

2.9.2. Vision

NNP staff recognize their obligation to assist neighbouring communities in addressing human-wildlife conflict (HWC) which results from wildlife leaving the park. This is done through providing advice and technical support in applying mitigation measures, and supporting implementation of local HWC management plans.

2.9.3. Strategies

- a) MET should give preference to NNP neighbours when allocating concessions, to help offset livestock losses as a result of HWC and to promote positive relationships with park neighbours.
- b) NNP and other MET staff should assist neighbouring communities to engage in land uses that avoid and help to reduce HWC. This extends to technical advice and support (e.g. applied livestock management, siting and operation of electric fences etc)
- c) Decision-making authority should be delegated to appropriate NNP staff so that individual problem animals can be speedily destroyed, providing protection to people and their property. Procedures for arriving at this decision must include sufficient safeguards so that specific animals are destroyed for good reason.
- d) NNP staff should fulfill monitoring and reporting requirements for MET's database on HWC, including effectiveness of mitigation methods.
- e) NNP and other MET staff should help to build capacity of neighbouring communities to develop HWC management and mitigation plans and to implement appropriate mitigation methods.
- f) Government will not provide direct compensation for livestock losses due to wild animals, but will help to build the Human Wildlife Self Reliance Scheme which will partially offset farmers' losses, and only where reasonable precautions have been taken.

2.9.4. Activities

Actions	Timing	Record of progress
1. Consider NNP neighbours when allocating concessions in the park	2012 and ongoing	
Collaborate with neighbouring communities to engage in appropriate land uses and apply appropriate farming practices to minimize HWC	2012 and ongoing	

Ensure lines of authority clearly outlined for speedy resolution of HWC problems, particularly if an animal needs to be destroyed / removed.	2012 and ongoing	
Keep an inventory of HWC cases that is consistent with MET practices and feeds into the MET HWC database.	2012 and ongoing	
Participate in activities to build the local Human Wildlife Self Reliance Scheme.	2012 and ongoing	

2.10. Diseases and parasites

2.10.1. Principle

Wildlife in the NNP should not pose any risk of diseases (e.g. rabies) to humans. Also, animals living in the Park and belonging to Topnaar residents should not pose any risk of communicable or contagious diseases to wildlife in the Park.

2.10.2. Vision

MET staff and Honorary Wardens will cooperate with other government or private agencies to manage and control any communicable, notifiable or contagious diseases (of humans, livestock and wildlife) that occur in the Park.

2.10.3. Strategies

- a) Establish a monitoring system, in cooperation with the Ministry of Health (for humans) and the Ministry of Agriculture, Water and Forestry (for livestock) that keeps an eye on diseases and parasites in the Park. For instance, rabies is legally notifiable, so incidents of this disease in jackals should be communicated to Veterinary Services staff and reported in their official records. The monitoring system should ensure lines of communication between relevant ministries are kept open.

2.10.4. Activities

Actions	Timing	Record of progress
1. MET staff to report incidents of diseases noted in livestock and pets in the Park.	2012 and ongoing	
2. Liaise with health and veterinary health departments to link in to their monitoring and reporting procedures.	2012 and ongoing	

2.11. Alien species

2.11.1. Principle

The NNP should be free of all invasive alien plants and animals, with the exception of the Desert Wild Horses in the Garub area.

2.11.2. Vision

No feral populations of alien plants and animals will be permitted within the NNP, with the exception of the Wild Horses which will be confined to the Garub area and treated as part of the history of the region. Domestic species will not be permitted in the NNP except under concession (e.g. horse trails), and then only where they pose no threat of invasion, are under the full control of designated owners or are an integral part of the operation of the park, and where they pose no threat to the conservation of indigenous species and the integrity of the park.

2.11.3. Strategies

- a) Establish a monitoring system for alien species, with particular attention to high risk species and areas such as along rivers and drainage lines, roadways, mining areas, water points, etc.
- b) Support and participate in national policies and action plans for strategic management of alien invasive plants, since alien invasive plant problems originate mostly outside of the Park.
- c) Manage feral populations of plants and animals as appropriate and practical including eradication where feasible.
- d) Establish community interest groups of local residents to help eradicate and monitor alien species, particularly where infestations occur from outside the NNP, e.g. along drainage lines entering the park.
- e) Make sure all aquaculture projects undergo a high quality EIA and that the issue of alien invasions is adequately addressed. As a consequence of the EIA, there must be an outcomes based EMP, which must be followed rigorously.
- f) Regularly inspect (minimum twice annually) all aquaculture projects. After each inspection, an inspection report must be completed and filed.
- g) Monitor infestations/spread of the alien invasive mussel (*Mytilus galloprovincialis*) and initiate remedial action if appropriate and practical.

2.11.4. Activities

Actions	Timing	Record of progress
1. Manage and where practical eradicate invasive alien species throughout the NNP	2012 and ongoing	
2. Work with neighbours to eradicate alien plants from drainage lines entering the NNP	2012 and ongoing	
3. Follow up on cleared areas and remove re-growth/new seedlings	2012 and ongoing	

4. Establish community interest groups of local residents to help address the invasive alien problem	2015 and ongoing	
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2.12. Law enforcement and crime prevention

2.12.1. Principle

Permits will only be required for access to restricted or concession areas (designated camp-sites, special events sites, tourism concession areas and sections of the park which are closed to general public access). Illegal entry, activities and use of wildlife, plants and other natural resources within and adjacent to the park should be controlled and kept to a minimum.

2.12.2. Vision

A zero tolerance approach will be followed against all illegal activities within and adjacent to the NNP. A partnership of collaboration will be established with all relevant stakeholders, under MET/MFMR leadership, to secure adherence to law and order in and around the NNP.

2.12.3. Strategies

- a) Develop a practical, harmonized approach to the implementation of law enforcement within the context of this PMP, Park legislation and regulations, by establishing strong partnerships between MET and MFMR, with the Namibian Police and Traffic Department and by establishing a team of Honorary Wardens.
- b) Plan, develop and implement, in partnership with MFMR, Namibian Police and Traffic Department, and the Honorary Wardens, an efficient and effective tourism management and access control system.
- c) Ensure security and anti-poaching (including plant, reptile and other natural resource collection/theft) patrols and surveillance are conducted at regular but unpredictable intervals, particularly in high-risk areas (e.g. along main access routes and around tourism and mining areas) and that they are highly visible.
- d) Develop an attractive reward system and let it (and the zero tolerance approach) be widely known in the area.
- e) Establish a "Hot-Line" for people to report transgressors, and an efficient response mechanism.
- f) Ensure that the Honorary Warden system, their roles and authority, are well publicized and known throughout the area, to both residents and visitors.
- g) Ensure that MET, MFMR and Honorary Wardens are well trained to preserve and collect evidence so that arrests result in convictions.

2.12.4. Activities

Actions	Timing	Record of progress

Plan (with relevant partners, including Hon. Wardens) a practical plan for implementing law enforcement in the context of this PMP & relevant legislation	2013	
Develop (with partners) an effective tourism management and access control system, with particular attention to the holiday seasons	Immediate and ongoing — be ready for peak holiday periods	
Disseminate information on zero tolerance approach & reward scheme, as well as information on roles and authority of Hon. Wardens	2013 and ongoing	
Carry out regular patrols (ground and air) to ensure high presence level	Ongoing	
Train staff and Hon Wardens in collection of evidence	2014 and ongoing	
Establish a Hot-Line for reporting of transgressors	2014	

2.13. Environmental impact assessment and management

2.13.1. Principle

Developments within NNP and/or that have an impact on the Park should be properly assessed so that environmental harm is minimized and benefits are optimised.

2.13.2. Vision

Developments within NNP and that have an impact on the Park are subjected to thorough and transparent EIAs in accordance with the Environmental Management Act (EMA). The EIAs receive critical and helpful input from local MET staff. Environmental Management Plans, which are practical and appropriate to the development, are properly implemented and monitored.

2.13.3. Strategies

- a) MET staff in NNP should be familiar with the Environmental Management Act and their role in enforcing it. They are important for ensuring that proposed developments in or close to the Park comply with the EMA.
- b) Lines of communication between DEA and DPW should be improved. The communications will be helpful to both directorates: DEA can alert MET staff on the ground about proposed developments in or close to the Park, and encourage them to make critical input to the EIA. Similarly, MET staff on the ground who observe activities which might require an EIA (such as mining exploration), can alert DEA about them.
- c) EIA reports and applications for Environmental Clearance under the EMA, that affect the NNP, should be circulated to local MET staff for

their input. Clearances should not be granted by DEA until representatives from DPW have given their consent. Local DPW staff should, in particular, carefully consider any conditions included in the Environmental Clearance.

- d) NNP staff should keep familiar with developments in and close to the Park through the workings of the Management Committee and the Consultative Forum.

2.13.4. Activities

Actions	Timing	Record of progress
1. Keep NNP staff familiar with developments around uranium mining in the Park through official visits to the Uranium Institute and keeping close ties with the SEMP office in MME.	2012	
2. Deploy Environmental Officers under the Environmental Commissioner to the Coastal Parks headquarters.	When the EMA structure is established	
3. Give EIA training to DPW staff so that they know what role they should play in ensuring proper compliance with the EMA.	2012 and ongoing	
4. Ensure that the NNP management structure (including Management Committee, Consultative Forum and Strategic Forum) functions properly. This will create a conducive atmosphere for EIAs fulfilling their full potential.	2015 and ongoing	

2.14. Consumptive resource utilization

2.14.1. Principle

Regarding plant resources: The lower reaches of the Kuiseb River in the NNP are the home of Topnaar people, who traditionally use local resources such as !nara plants and local firewood for their livelihood. Use of these resources should be allowed only through a permit system which has input from the Topnaar Traditional Authority, and as long as traditional harvesting methods are used.

Regarding wildlife resources: Wildlife may be harvested or culled or translocated as long as there is adequate proof from ongoing monitoring that the population can withstand the intended offtake, and that there is full justification for one of the following reasons:

- removal of individuals causing conflict with people;

- provision of meat for traditional festivals or national events, in keeping with sustainable offtake levels and never for personal gain by individuals. This must also be in line with the National Policy on Provision of Game Meat;
- for community benefit in collaboration with neighbouring conservancies and in keeping with sustainable offtake levels.

2.14.2. Vision

Plant and wildlife resources in the NNP are harvested for social and economic gain, at offtake levels that are sustainable.

Natural plant products in NNP (predominantly !naras and firewood) that are part of the traditional and cultural heritage of Topnaar people, are harvested sustainably for the benefit of local rural communities. Over-exploitation of the products is prevented by imposing the condition that harvesting methods must be traditional (). These restrictions help to prevent wastage and excessive harvesting by any one individual.

2.14.3. Strategies

- MET staff should liaise closely with the Topnaar Traditional Authority with regard to !nara harvesting activities. Harvesting should only be allowed with a permit, issued by MET staff in Walvis Bay and Swakopmund.
- Permits to harvest !nara fruit and firewood in NNP should be issued on application for a year at a time, to Topnaar families resident in the Park. Permit conditions should clearly state that only traditional methods may be used i.e. pick only fruits that are adequately ripe, and use only donkey carts to transport the fruits out of the !nara fields. No-one will be permitted to load up bakkies with !nara fruits or firewood.
- Compliance with these regulations should be monitored with the assistance of Honorary Wardens drawn from the Topnaar community living in the Park.
- Wildlife populations and movements should be monitored and recorded so that sustainable offtake quotas can be calculated.
- Hunting for festivals or other important functions should be carried out in accordance with the National Policy on Provision of Game Meat and the park zonation plan.
- Depending on the offtake level calculated from ongoing population monitoring records, the NNP could be used as a source of live animals (e.g. mountain zebra) for introduction to other areas.
- Consumptive use of wildlife goods must comply with existing national and international legal frameworks and conventions, such as CITES.

2.14.4. Activities

Actions	Timing	Record of progress
1. Include at least 2 people drawn from the Topnaar community living in the NNP, in the Honorary Wardens.	Mid 2015	
2. MET staff, through their patrols, should stay familiar with the state of resources used by the Topnaars.	2012 and ongoing.	

People found harvesting Inaras using non-traditional means or without a permit should be arrested and their equipment confiscated.		
3. The MET offices in Walvis Bay and Swakopmund should keep records of the permits issued for harvesting. This will serve as a rough indication of the level of harvesting. Field staff should be familiar with the rough number of permits issued so that higher levels of harvesting are noted and responded to. Evidence of over-use or decline of the resources should be brought up for discussion in the Mgt Committee and Consultative Forum meetings.	2012 and ongoing	
4. Undertake regular wildlife population monitoring using a standard MET format (e.g. Event Book)	2012 and ongoing	
5. Calculate sustainable offtake levels for appropriate species, using recognized methods and adaptive management principles	2012 and ongoing.	
6. Provide game meat for special occasions only when properly authorized as set out in the National Policy, and only when calculated offtake levels allow.	2012 and ongoing	
7. Allow hunting or live capture for wildlife goods only when calculated offtake levels and relevant regulations allow.	2012 and ongoing	

2.15. Aquaculture

No aquaculture will be permitted in the NNP.

2.16. Archaeological and historical heritage

2.16.1. Principle

The very rich archaeological and historical heritage of the central and coastal Namib, which presents valuable information about occupation of this area going back 700,000 years, has unique value and should be properly preserved.

2.16.2. Vision

- To ensure that cultural, historical and archaeological sites are identified, conserved and where appropriate, sensitively used, to improve society’s understanding and knowledge of the people who used the area in the past.
- Specifically, to prevent negative impacts on archaeological and historic sites that might be incurred by tourism, mining, infrastructure development, or other activities.

2.16.3. Strategies

- a) All sites used and proposed for development must address cultural, historical and archaeological aspects in their EIAs and EMPs;
- b) Where appropriate, sites may be made accessible to the public, but this must be done in a sensitive and responsible manner. Sites that add to the tourism experience should be interpreted for the public’s benefit. Activities to monitor the state of these sites should be included so that preventative action can be taken if they become degraded.
- c) Collaboration with other agencies and ministries (e.g. universities, Gobabeb Research and Training Centre, National Heritage Council, UNESCO) should be initiated and maintained for appropriate management of these resources. Where necessary, technical and financial assistance should be sought.

2.16.4. Activities

Actions	Timing	Record of progress
Ensure EIAs done for development projects in the NNP address risks to the archaeological and historic heritage. Where impacts are unavoidable, ensure that adequate mitigation, restoration or offsetting is achieved. As stipulated in the Environmental Management Act, this should be at the cost of the developer.	Ongoing	
In collaboration with the National Heritage Council and local or interested archaeologists, develop and maintain a register of all known sites of archaeological and historic interest.	2012 and ongoing	
Keep familiar with and if possible, participate in archaeological and historical research projects undertaken in NNP. Ensure that data and materials are securely deposited with the National Museum for safekeeping.	2012 and ongoing	
In collaboration with the National Heritage Council and other possible	2012 and ongoing	

stakeholders, develop archaeological and historic sites (only those that can tolerate human pressure) for well managed tourism access.		
Include sites of archaeological or historic interest in the regular patrols and Event Book management systems, for regular inspection and monitoring.	2012 and ongoing	

2.17. Research

2.17.1. Principle

Management and development of the NNP should be information-based, drawing on good quality research and monitoring. To ensure that good data are available, the Park should implement a research-friendly and supportive philosophy and encourage the non-invasive use of the park as an open air laboratory. The Gobabeb Training and Research Centre will be the scientific service centre for the park.

2.17.2. Vision

Park management will be based on good scientific information. Gobabeb will be supported to become the research headquarters for the Park, and to become a research hub for MET and partner research on desert systems of Namibia. A supportive environment will be created for visiting scientists, including the facilitation of research permits. Two levels of research are recognized:

- (a) Applied research in support of priority park information and management needs, and
- (b) Basic or interest research identified by outside researchers.

Preferential support will be given to the former, while the latter will be supported when feasible. All forms of research are encouraged, including biological, hydrological, geological, paleontological, archaeological, historical, climatological, social, economic, etc.

2.17.3. Strategies

- a) A prioritised and open-ended list of key research topics should be developed for the Park and disseminated to appropriate research institutions.
- b) An appropriate support mechanism should be developed for visiting scientists, making use of Gobabeb where appropriate, with emphasis on those addressing priority research topics relevant to the park.
- c) Appropriate mechanisms should be developed to ensure that optimum feed-back and other values from national and visiting researchers are obtained.
- d) Links should be established with research activities carried out in other parks, particularly in arid regions, as well as with other relevant research organisations and field stations in Namibia, and comparative studies

between the different desert ecosystems should be encouraged, including transboundary work with other components of the Nama and Succulent Karoo, Kalahari and Namib Ecosystems, in adjacent countries.

- e) Ensure that Gobabeb is integrated into the Park Information System and meta database and that results from research are added to this System.

2.17.4. Activities

Actions	Timing	Record of progress
1. Develop an open-ended list of priority research topics based on information needs for NNP management, facilitated by Gobabeb.	Start in 2013 and ongoing	
2. Design a reciprocal “support package” for researchers addressing priority research topics and ensuring maximum returns to the NNP, the Coastal Parks and Namibia, facilitated by Gobabeb	2013 and ongoing	
3. Participate actively in comparative research programmes across the arid zones and between the various desert ecosystems	2012 and ongoing	
4. Ensure research outputs and findings are integrated with monitoring data in the Park Information System.	From 2012	

2.18. Monitoring and Information Management

2.18.1. Principle

Carefully selected indicators and groups of indicators are monitored to allow for timely and judicious assessments and adaptive management.

2.18.2. Vision

A minimal but regular monitoring of climate, key habitats and biodiversity, land use impacts, water quality, park management performance and other key indicators will be conducted and promoted to help understand ecological changes, stresses and management effectiveness.

Participatory monitoring will be encouraged and, where appropriate, monitoring shall be outsourced to special interest groups and specialist stakeholders.

Information and data resulting from monitoring activities will be recorded, stored and curated as time-series and geo-referenced data sets within a Coastal Parks Information System.

The information produced from the monitoring systems will be in the public domain and will feed into adaptive management decision-making.

2.18.3. Strategies

- a) Monitoring will focus on key indicator processes, impacts, habitats and species, with an emphasis on ensuring regular data collection at appropriate intervals, cost efficiency and sustainability.
- b) Monitoring will also assess the effectiveness of management of the NNP, applying best practice tools such as “Namibia’s Management Effectiveness Tracking Tool” (NAMETT).
- c) Monitoring systems shall apply approved tools already being widely used (e.g. Event Book system), and shall also continue with systems already established and running within the NNP, (e.g. Ramsar wetland bird counts, Damara Tern monitoring).
- d) Monitoring systems will be balanced to ensure that the entire range of critical information needs is covered.
- e) A Coastal Parks Information System will be established to store, manage and help analyse spatial and temporal data sets as well as other pertinent information.
- f) Information will be made widely and freely available, in accessible format, to all stakeholders, including via the media.

2.18.4. Activities

Actions	Timing	Record of progress
Develop an appropriate monitoring framework to include the monitoring requirements of the NNP, and incorporate ongoing monitoring initiatives (e.g. wetland counts, Damara Tern monitoring), and where appropriate, adapt other national systems such as the “Event-Book”, with appropriate training for staff and other implementing partners	2013 onwards	
Develop an accessible and user-friendly Coastal Parks Information System and meta database (for spatial & temporal data and other info), that can be easily expanded and up-scaled to serve larger co-managed landscape complexes, to: <ul style="list-style-type: none"> • store, manage, curate data/info • retrieve, interrogate, analyse and aggregate data/info • generate reports based on carefully designed templates for key 	2014 and ongoing	

information needs		
Establish fixed photo-point and aerial photography monitoring of key aspects (e.g. ephemeral river for impact of water abstraction, tracks, mining footprint, etc), and repeat photographs at regular intervals (every 6 or 12 months)	2013 onwards	
Make time-series data and analysed information available for adaptive management, and for distribution to interested stakeholders, decision-makers and the general public	Ongoing	
Use above data and information to prepare an annual State of the Coastal Parks Report. Establish computer-based analyses and map/figure protocols to automate this process as far as possible, with minimal explanatory text.	2014 and ongoing	

2.19. Coastal management

2.19.1. Principle

The intertidal coastal zone, its biota and the species that transcend the marine/terrestrial interface should be managed jointly by the MET and MFMR under agreed co-management principles and protocols that promote synergy, efficiency and elevated conservation management, monitoring and protection of habitats, processes and species.

2.19.2. Vision

The intertidal co-management approach is a model of collaboration with clear benefits to the ecosystem and responsible institutions, such that the approach is expanded to the entire Namibian coast.

2.19.3. Strategies

- a) A close and mutually supportive working environment will be created between the Park MET and MFMR institutions and their respective staff. To this end, a Park MET-MFMR Management Committee will be established.
- b) The above Committee will identify the key areas, issues and species that require joint monitoring and management.
- c) The above Committee will establish operational principles, procedures and protocols for monitoring, managing and reporting on the areas and biota of mutual interest, as well as means of collaboration, communication and mutual support.

2.19.4. Activities

Actions	Timing	Record of progress
1. Establish a MET/MFMR Management Committee	2013	
2. Establish practical and efficient operating procedures for collaboration, communication and reporting for identified priority areas and species.	2013	
3. Explore ways of expanding collaboration and co-management where this would be beneficial to the ecosystem and to the partner institutions.	2014 and ongoing	

3. Regional conservation, park neighbour and resident relations

3.1. Transfrontier conservation

While the Coastal Parks share boundaries with the Iona National Park in Angola and the Richtersveld National Park in South Africa, the Namib Naukluft Park has no direct part in transfrontier conservation activities with these parks.

3.2. Landscape level management

3.2.1. Principle

Open, contiguous and ecologically optimal landscapes and seascapes and their interface should be maintained and managed to ensure seamless linkages between the central Namib and adjacent terrestrial and coastal ecosystems.

3.2.2. Vision

To maintain and, where relevant, expand the area under conservation management, and manage for larger landscape values, through partnership, with particular emphasis on:

- (i) east-west and north-south linkages between the terrestrial, coastal and marine ecosystems, in partnership with the MFMR and neighbouring land-holders;
- (ii) linkages with neighbouring Protected Areas of the Coastal Parks.

3.2.3. Strategies

- a) Work with MFMR to identify coastal and marine protected area collaboration adjacent to the NNP and to strengthen co-management mechanisms and partnerships.
- b) Establish seamless collaboration and cooperation procedures and practices with other management units.
- c) A hard eastern boundary to the NNP is a major environmental impediment to natural wildlife migration up into the escarpment, particularly in dry times, and a significant cause of mortality and population diminution in some species. It also prevents species that would enter the NNP from the east in good rainfall years from doing so. It is therefore a high priority to pro-actively work with neighbours to promote open, co-managed systems that link the NNP to the escarpment.

3.2.4. Activities

Actions	Timing	Record of progress
1. Establish an effective collaborative framework between MET and MFMR to	2013 and ongoing	

plan and harmonise terrestrial and coastal/marine protected areas and their rational and efficient management, including a focus on collaboration and co-management		
2. Establish a planning, management and monitoring framework for collaboration, cooperation, mutual support and harmonization with other management units in the Coastal Parks and neighbouring areas.	2013 and ongoing	
3. Pro-actively engage with neighbouring land-owners to the east of the NNP that have compatible land uses, to create open, co-managed systems that help link the NNP to the escarpment.	2013 and ongoing	

3.3. Park neighbours and resident communities

3.3.1. Principle

The NNP should be managed and developed through positive and constructive relationships with its neighbouring and resident communities.

3.3.2. Vision

To include park residents and neighbours and adjacent land owners in co-management of the overall area, for the long term benefit of both NNP and the conservancies that adjoin it, in terms of conservation outcomes and the livelihoods of community members.

3.3.3. Strategies

- a) Establish positive, constructive relationships with park stakeholders in line with the National Policy on Protected Areas, Neighbours and Resident Communities.
- b) Include senior representatives (e.g. Traditional Authorities) from neighbouring and resident communities and conservancies in the Strategic Forum.
- c) Include representation (e.g. conservancy managers) from neighbouring communities and conservancies in the Consultative Forum.
- d) Draw members from the neighbouring communities into the Honorary Wardens system, to work with MET and MFMR to help implement this PMP.
- e) Facilitate park-to-neighbour liaison, with particular focus on establishing linkages between the Namib and the escarpment, to

reinstate wildlife movement patterns and to help counter the potential impacts of climate change.

3.3.4. Activities

Actions	Timing	Record of progress
1. Select appropriate senior community representatives for the Strategic Forum.	By mid 2013	
2. Select appropriate technical level representatives with conservation experience for the Consultative Forum.	By mid 2013	
3. Select appropriate community representatives for deployment as Honorary Wardens.	By end 2013	
4. Where relevant, draw neighbours into planning for a Greater Namib-Coastal Parks Complex with links to and beyond the escarpment.	Mid 2012	
5. Create an inclusive, participatory management approach where all interested stakeholders can contribute ideas, energy and time; foster a spirit of volunteerism; and keep everyone well informed of activities and progress in the NNP	Ongoing	

3.4. Private partnerships

3.4.1. Principle

The “world class Protected Desert Landscape and Tourism destination” vision for the NNP, under the brand “Desert Discovery”, is planned, managed, implemented, developed and monitored using a collective partnership-management approach that fully involves civil society, business and relevant government agencies.

3.4.2. Vision

To develop co-management mechanisms that fully integrate MET and MFMR, the relevant business sector, civil society (including environmental NGOs and communities), into all aspects of the management and development of the NNP in full collaboration and “smart partnerships”, and with the respective partners being empowered to contribute to their full competitive competencies.

3.4.3. Strategy

- a) Establish a strategic NNP Steering Body (the Strategic Forum) that provides overall direction, assesses progress and performance and helps to remove constraints, and comprises representation at senior levels of relevant stakeholders including Regional Council, municipalities, key line ministries, business sector, community and civil society sectors, environment and development sectors, etc.
- b) Establish a practical Consultative Forum that provides ongoing operational assistance, guidance, support and feedback, and comprises practitioners in relevant sectors such as municipalities, business, NGOs, line ministries, community groups, etc.
- c) Establish a team of Honorary Wardens to work with MET and MFMR to help implement this PMP, legislation, regulations and zonation. The roles and authority of the Honorary Wardens should be widely publicized.
- d) Establish procedures for planning, managing, developing and monitoring the NNP seamlessly with adjacent Protected Areas, and with the coastal and marine ecosystem.
- e) Together with the other Coastal Parks, engage pro-actively with willing neighbours, to explore the establishment of a co-management and development approach for the “Greater Namib Complex” to enhance the development of a shared vision, common objectives and agreed principles, and promote a common management approach, as well as to facilitate park-to-neighbour liaison, with particular focus on establishing linkages between the Namib and the escarpment, to reinstate wildlife movement patterns and to help counter the potential impacts of climate change.
- f) Work closely with Regional Government, municipalities, organized business and interest groups, communities, NGOs and the media to keep people informed of developments, to invite their input and participation in these and future evolving initiatives.

3.4.4. Activities

Actions	Timing	Record of progress
Establish a NNP Strategic Forum with clear Terms of Reference	Early 2013	
Establish a NNP Consultative Forum with clear Terms of Reference	Mid 2013	
Appoint a team of Honorary Wardens with clear TOR and identification mechanisms, ensure that these appointments are well advertised and their responsibilities and authority well publicized and that the appointees receive orientation and training on their roles and responsibilities	By end 2013	
Establish close and collaborative working relations and clear procedures for seamless	By end 2013	

collaboration between adjacent Protected Areas		
Establish close and collaborative working relations and clear procedures for seamless collaboration between MET and partners on the terrestrial landscapes with MFMR in the coastal and marine ecosystems	By end 2013	
Where relevant, participate in the development of a Greater Namib Complex with park neighbours	Mid 2012	
Create an inclusive, participatory environment within the NNP where all interested stakeholders can contribute ideas, energy and time; foster a spirit of volunteerism; and keep everyone well informed of activities and progress.	Ongoing	
Initiate a feasibility assessment for the Greater Namib Complex (Park and neighbours) to become registered as a World Heritage Site.	2011	

3.5. Environmental education and awareness

3.5.1. Principle

The Namib, escarpment and adjacent coastal ecosystems offer unique open-air classroom and laboratory opportunities for education and awareness creation on the subjects of geology, geomorphology, climatology, hydrology, zoology, botany, arid-zone ecology, wetland biology, adaptive evolution, paleontology, archaeology, conservation, sustainable development and many other fields. The NNP contains dune fields, gravel plains, ephemeral rivers, sandy and rocky shores, wetlands of international importance, inselbergs and mountain ranges, a host of arid-adapted plant and animal life plus human-ecosystem interactions. The area thus has huge educational and awareness-raising potential, which should be exploited in the interests of ensuring that visitors and staff are well informed and enriched by associating with the NNP.

3.5.2. Vision

To develop good quality, accessible and stimulating information and activities on the key biophysical and socio-archaeological aspects of the different habitats within the Namib, escarpment and coastal ecosystems that are represented within the NNP, and to share this information with guests, visitors, youth groups, specialist groups, decision-makers, officials and the general public in interesting and exciting ways so as to promote an understanding of and commitment to the conservation and sustainable development of the Namib Desert and coastal areas of Namibia. Participatory

and collaborative mechanisms will be used, harnessing the strengths of different government agencies, NGOs and special interest groups, the business community and the Gobabeb Training and Research Centre.

3.5.3. Strategy

- a) Establish an Information Centre in the NNP.
- b) Prepare good quality information in different forms (posters, brochures, reports, maps, newsletters, displays, booklets, DVDs, website, etc.) that is made available to visitors, staff and the general public.
- c) Ensure that research carried out in the NNP and other parts of the Coastal Parks is translated into accessible information for the lay person.
- d) Engage local communities, schools, youth groups and decision-makers in ongoing activities, e.g. bird counts and other monitoring, and organize field excursions into key areas of the NNP, including visits to the Gobabeb Centre.
- e) Promote the concept of “sustainable lifestyles” with special attention to contextualizing the concept for desert environments.
- f) Ensure that tour guides are well trained at national and local levels, and that they create exceptional field experiences for tourists by sharing their knowledge in interesting and stimulating ways.

3.5.4. Activities

Actions	Timing	Record of progress
Establish an Information Centre for the Park.	2014	
Compile good quality information on different aspects of the geology, ecology, archaeology, etc. of the NNP and from this, prepare materials for the dissemination of key information, e.g. Damara Terns, Important Bird Areas, Ramsar wetlands, lichens, etc.	Ongoing	
Produce small information boards for strategic placement at key sites	2013 and ongoing	
Produce maps and special information sheets on aspects such as off-road driving, areas open to quad bikes and expected etiquette, duties and responsibilities of Honorary Wardens, info on the Environmental Hot-Line, etc.	2013	
Set standards for tour guides – both procedural (e.g. track etiquette) and technical (environmental knowledge, etc), as well as social (tourism interaction skills) - at both the NNP and Coastal Park levels.	2013-2014	

4. Zonation

4.1. Principle

The matrix of landscapes and habitats within the NNP should be optimally managed and sustainably used, based on their sensitivity, conservation importance and business opportunity, in that order. This will be achieved by means of a Zonation Plan. The plan should remain dynamic and responsive to the potential for future opportunities, partnerships, linkages and corridors, and to developing the economic potential of the greater area within the context of biodiversity and landscape conservation, and sustainable development.

4.2. Vision

To zone the NNP for enhanced conservation management and appropriate utilization, to minimize potential conflicts between activities and to facilitate potential “bigger picture” conservation and development goals for the area.

4.3. Zones

Zonation is based on best available information on environmental sensitivity, biodiversity status and conservation priorities. Around this are built the management and tourism activities and opportunities, and infrastructure development.

4.3.1. Environmental sensitivity

The areas of conservation priority and environmental sensitivity in the NNP are shown in Figure 2, based on their IUCN zonation categories (Table 2). The key areas are:

- The Tsondabvlei and river system
- The Kuiseb river and valley system
- The Sossusvlei and Tsauchab river
- The Koichab Pan and river
- The coastal salt pans and salt flats, which are also Damara Tern breeding sites. All Damara Tern sites (which may change over time) become automatically sites of conservation priority with appropriate management responses
- Coastal bluffs, headlands and bays
- All inselbergs, with particular importance given to those with especially high biodiversity values such as Dikwillem in the south-east
- Mountain ranges on the eastern border of the NNP
- Gravel plains
- The Naukluft, with its associated incised river courses and wetlands.

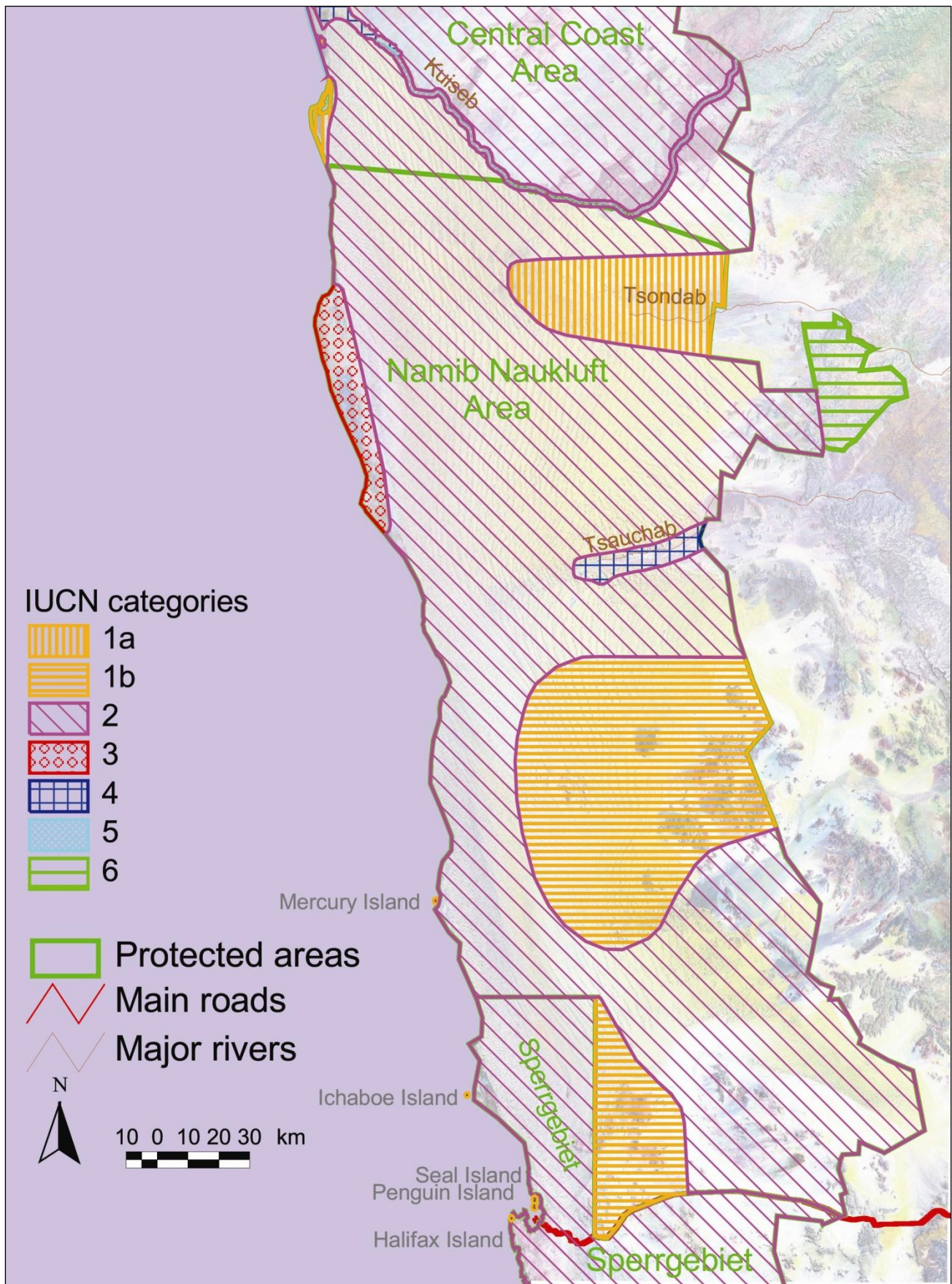


Figure 3: Zones in the Namib Naukluft Park. See p 55 for Land-use and Management zones.

The following zones have been identified, based upon environmental sensitivity and appropriate land uses (Figure 3), and following international guidelines for Protected Areas (IUCN 2012):

- Highly sensitive areas (category 1a)
- Wilderness areas (category 1b)
- Areas of medium sensitivity (category 2)
- Areas with outstanding features (category 3)
- Areas with specific habitat or species sensitivity (category 4)
- Areas with general landscape or seascape value (category 5)
- Areas for utilization of natural resources (category 6).

Zones	Activities	Specific application in the NNP
Highly sensitive areas (1a)	<ul style="list-style-type: none"> • Highly sensitive and high value conservation / biodiversity areas set aside for sensitive and low non-intrusive scientific study • No or minimal mechanized access • No permanent structures • No overnighting 	<p>Areas of high environmental value and sensitivity:</p> <ul style="list-style-type: none"> • Tsondabvlei and river system, and adjacent dune and plain areas to the west • Coastal salt pans / flats • All Damara Tern breeding areas • Inselbergs such as Dikwillem and Uri-Hauchab
Wilderness Areas (1b)	<ul style="list-style-type: none"> • Sensitive ecosystems • High value “sense of place” • Low impact usage • No or minimal mechanization • No permanent structures 	<ul style="list-style-type: none"> • Bushman Hills, Chowagasberg, Awasibberge and Haiber Flats area • Part of the Naukluft mountain • Dikwillem area • The entire coastal strip
Areas of medium sensitivity (2)	<ul style="list-style-type: none"> • Managed for conservation and controlled tourism • Mechanised access permitted • Overnighting only at designated sites 	<p>The whole NNP, but excluding the demarcated municipal areas, is proclaimed under this category. The other categories are managed as land-use zones within the overall National Park.</p>
Areas with outstanding features	<ul style="list-style-type: none"> • Conservation of specific outstanding features, including landscapes, geology, 	<ul style="list-style-type: none"> • Conception Bay to just south of Meob Bay

Zones	Activities	Specific application in the NNP
(3)	paleontology, archaeology, history, cultural and heritage	
Areas with specific habitat or species sensitivity (4)	<ul style="list-style-type: none"> Protected areas managed mainly for conservation through active management intervention To deliver benefits to people within the scope of sustainable practices 	<ul style="list-style-type: none"> Part of the Naukluft? (hunting area check) Lower Kuiseb River, used by Topnaar community members and their livestock (in Dorob NP)
Areas with general landscape or seascape value (5)	<ul style="list-style-type: none"> Relatively open access for public enjoyment Generally higher intensity use and lower regulatory areas Add to welfare of local communities 	<ul style="list-style-type: none"> Sossusvlei area, for high intensity tourism
Areas for utilization of natural resources (6)	<ul style="list-style-type: none"> Managed mainly for the sustainable use of natural resources, e.g. fishing. Managed to ensure long-term protection and maintenance of biological diversity while providing at same time a sustained flow of natural products and services to meet local and national development needs, e.g. mining 	<ul style="list-style-type: none"> Mining sites (following compulsory EIA) – but only mining of strategic minerals (no „hobby“, subsistence or dimension stone mining)

4.3.2. Land uses

The following land uses are permitted and/or should be developed within the Namib Naukluft Park:

Land use categories	Specific applications
1. Accommodation	1.1 Up-market Lodge development concession opportunity for the Gobabeb Research and Training Centre in the Kuiseb River, max 24 beds, including

	<p>an area of plains, river bed and dunes. This concession package focuses on “information / research” tourism, and could involve overnight fly camps, hiring and 4x4 guided trails on approved routes.</p> <p>1.2 Up-market Lodge concession site in the Sesriem / Sossusvlei area for Namibia Wildlife Resorts (NWR). Max 16 beds.</p> <p>1.3 Tented camp concession site, max 16 beds, on the coast, south of Meob Bay.</p> <p>1.4 Upgrade and develop existing old farm houses in the Naukluft area as (a) trophy hunting lodge and (b) B &B and/or self catering accommodation.</p>
2. Camp sites	<p>2.1 Camp site at Hobas (Homeb) in the Kuiseb River, as a concession site to the Topnaar community. This may be upgraded to add tourist bungalows or a lodge, either directly by the concessionaire or as a joint venture. Max 24 beds</p> <p>2.2 Sesriem camp site, run by NWR.</p>
3. Day visitors	<p>3.1 Sossusvlei / Tsauchab River / Sesriem area, open to day visitors as well as Sesriem camping and lodge overnight visitors. A specific “Tourism carrying capacity and management systems” study and implementation plan should be commissioned for this high intensity use area</p>
4. Ballooning	<p>4.1 Ballooning concession area south of Sossusvlei / Tsondab River, with soft outer boundary because of dependence on wind</p>
5. Hiking	<p>5.1 Guided hiking trail concession in the Kuiseb River, which may also be developed as a mule trail (to support hikers), with designated overnight camping sites with appropriate and approved waste management</p> <p>5.2 Unguided demarcated hiking trails in the Naukluft Mountains, with designated overnight camping sites</p>
6. Guided 4x4 trails	<p>6.1 4x4 guided coastal & dunes trail from Walvis Bay and/or Rooibank area to Conception Bay area concession, overnighting at designated sites with appropriate and approved waste management</p> <p>6.2 4x4 guided coastal & dunes trail from Luderitz and/or from the Aus-Luderitz road to Walvis Bay concession, overnight camping at designated sites with appropriate and approved waste management</p> <p>6.3 4x4 guided trans-Namib dunes trail from Naukluft to Conception Bay and north to Walvis Bay and/or</p>

	<p>Rooibank concession, overnight camping at designated sites with appropriate and approved waste management</p> <p>6.4 4x4 guided plains, river and dunes trail from the NNP eastern border about 40 km north of Sesriem to the Kuiseb River, down the river for about 45 km, then south and west to Conception Bay and north to Walvis Bay and/or Rooibank concession, overnight camping at designated sites with appropriate and approved waste management</p>
7. Wild horses trails	7.1 Guided wild horses concession area in the Aus / Garub south-eastern corner of the NNP, accessed by 4x4, horse riding or hiking, with overnight camping at designated sites with appropriate and approved waste management
8. Eastern Namib plains & mountains concession, with 4x4 link to coast	8.1 Concession area on eastern boundary, north of the Wild Horses Concession area, for small groups on concessionaire's vehicles (max 2 vehicles), with overnight fly camping with appropriate and approved waste management, and with possible 4x4 link to coast and then down to Luderitz or Aus-Luderitz road
9. Hunting	9.1 Hunting concession in the Naukluft Park to the Topnaar community, quotas to be set by MET on a three-yearly basis, adjusted where necessary year-on-year, and professional hunting contract to be reviewed and agreed by MET

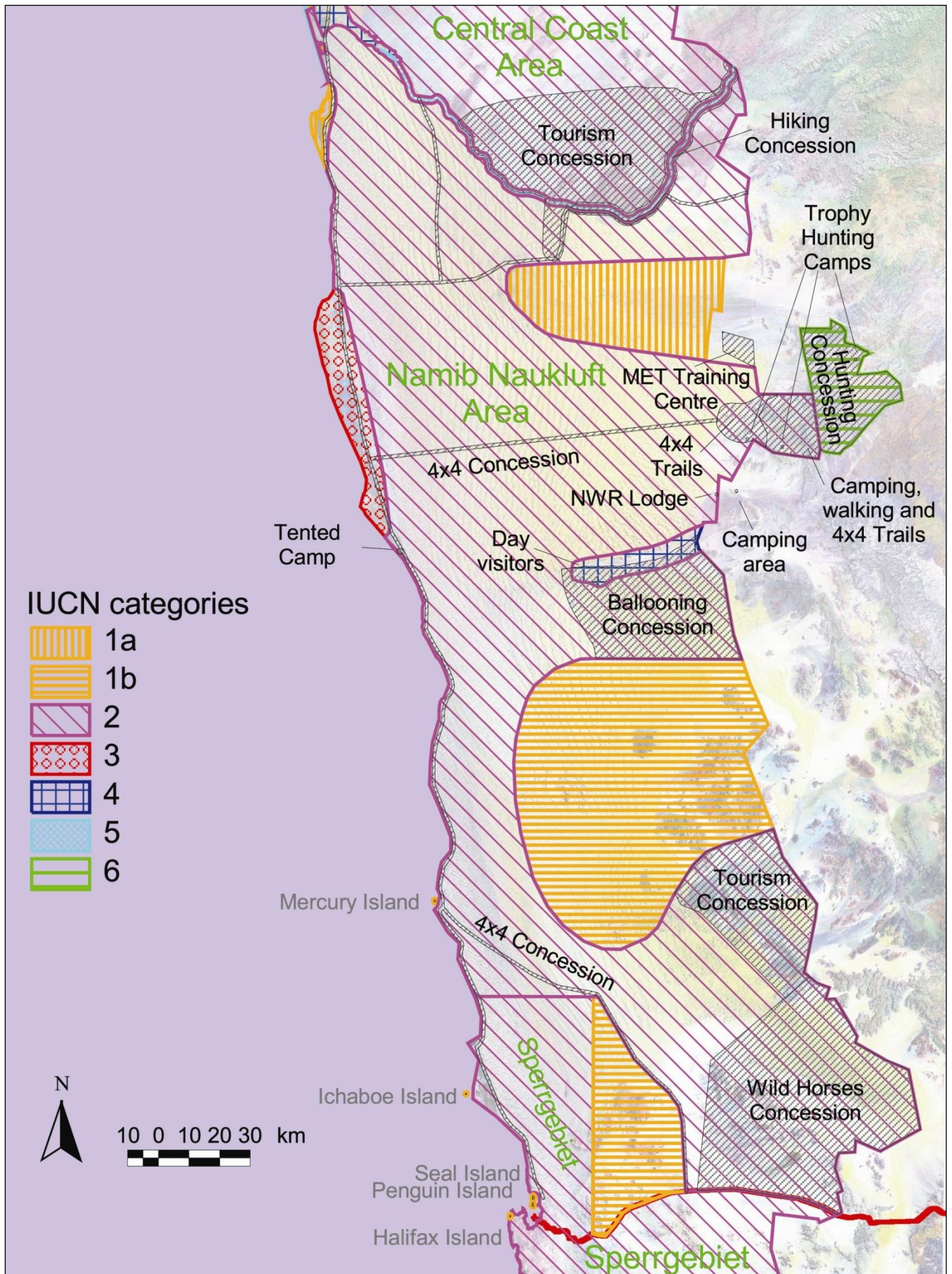


Figure 4: Land use and concessions for the Namib Naukluft Park.

4.3.3. Activities

Actions	Timing	Record of progress
1. Complete list of allowable activities per zone	End 2013	
2. Prepare poster for residents, visitors and officials on zonation and activities	Mid 2014	

5. Prospecting and mining

5.1.1. Principle:

No prospecting and mining activities should take place for non-strategic minerals anywhere in the NNP. For strategic minerals, no mining should be permitted in areas of high sensitivity or conservation value (Categories 1a, 1b and 3). All prospecting and mining activities in other areas should be planned, managed and decommissioned using best available practice, taking into account long-term national benefits vis-à-vis benefits from other current and potential land-uses, and applying precautionary and polluter pays principles and due caution so as to minimize negative environmental impacts.

5.1.2. Vision:

To not allow any prospecting and mining activities anywhere in the NNP for non-strategic and low value minerals (e.g. dimension stone), and also to not allow prospecting and mining in areas zoned as categories 1a, 1b and 3 (having high sensitivity or conservation value). Further, to integrate high value, nationally strategic prospecting and mining activities in other parts of the Park into the land-use and management of the NNP in ways that minimize environmental and socio-economic impacts and that optimize biodiversity, ecosystem and landscape conservation. To restore areas damaged by past prospecting and mining to as near a natural state as can reasonably be expected, or as may be decided.

5.1.3. Strategies

- a) Key zones categorized for high conservation values (i.e. those falling into IUCN categories of 1a, 1b and 3) will be demarcated and closed to prospecting and mining.
- b) Prospecting and mining in other parts of the NNP will be for high value nationally important minerals only. No low value, non-strategic prospecting and mining will be permitted (e.g. dimension stone, semi-precious stone).
- c) The long-term national benefits from the use of the land for mining must clearly outweigh benefits from other appropriate forms of land use, such as recreation and sustainable tourism. The onus is on the proponent to demonstrate such national comparative benefits, taking into account ecosystem services and non-monetary benefits of peoples' perceptions and how residents and visitors wish to use their countryside.
- d) Applying safeguards is a key strategy for avoiding and/or reducing impacts to acceptable levels. All prospecting and mining activities MUST be preceded by an Environmental Impact Assessment in accordance with the word and spirit of Namibia's EA Policy (1995) and legislation (Environmental Management Act No. 7 of 2007, and Minerals (Prospecting and Mining) Act, 2003.). The logical consequence of the EIA is the compilation of an Environmental Management Plan (EMP). The EMP must define both outcomes and the methodology (in some detail) as to how the outcomes will be achieved.
- e) Every approved prospecting and/or mining company must provide the NNP staff with an environmental report every 6 months, showing its progress towards meeting agreed upon safeguard targets. Once prospecting and/or mining has ceased, the impacts must be rehabilitated in accordance with the stipulations of the EMP.

- f) Communication with prospecting and mining companies is conducted on a regular basis to ensure that mutual expectations are clear and reinforced. Mining representatives will serve on the Consultative Forums, but it is still necessary for the Park staff to visit and talk to operators on the ground. Regular visits will not only facilitate dialogue, but they will also demonstrate MET's "hands on" approach towards monitoring. Visits by MET staff must be fully facilitated by mining companies in a spirit of open-cards and transparent partnership.
- g) Monitor implementation of EMPs, paying special attention to the achievement of safeguard targets. A detailed inspection report must be completed after each visit to the prospect or mine by Park staff, with copies sent to MET Head Office, the DPWMC, the mine/company inspected and the Mining Commissioner within MME. The report must include an "action" column, where it is clear what action needs to be undertaken by whom and by when, to remedy an environmental concern. As far as possible, the inspecting office should take photographs of key issues of concern. These should be digital since the camera will record date and time – both essential pieces of information. If possible, the inspecting officer must obtain the counter-signature of the prospector/miner who was present during the inspection.
- h) In the case of non-compliance, Park staff must immediately report the matter to the DPWMC in order to enable "in house" remediation. If this fails, the matter must be reported to MET HQ for higher level attention. The Park should request external review/inspection should they not have the technical capacity to assess the situation themselves. If possible (i.e. within the provisions of the law), the prospector/miner must be responsible for carrying all the costs of external consultants. Refer to the Environmental Management Act (No. 7 of 2007) for specific actions to be taken.
- i) Establish a "daily park user fee" mechanism (as per filming industry) for prospecting and mining. The fees shall accrue in an account available for park management and development activities in compliance with the PMP. The administration and management of the account shall be by the DPWMC and follow recognized accounting practices and standards.

5.1.4. Activities

Actions	Timing	Record of progress
1. Compile an inventory of all prospecting and mineral licenses in the NNP, noting type of license, its boundaries, conditions of approval, ownership, status and contact persons.	2011	
2. Establish a library of all the relevant EIA reports, EMPs and Records of Decision for each license.	2013 and ongoing	
3. Develop a "prospecting and mining	Mid 2014	

monitoring sheet” that enables easy field monitoring.		
4. Compile a “prospecting and mining inspection schedule” – say, twice annual visits. The schedule should be provided to each mineral license holder so that they know when to expect an inspection (this does not preclude unscheduled spot-checks).	2012	
5. Obtain agreement from MME to allow the establishment of park specific prospecting and mining user fees.	2014	
6. Monitor as per schedule.	Commence 2012 – thereafter ongoing	

6. Tourism management and development

6.1.1. Principle

Use of the NNP should be planned and implemented to retain a “Desert Discovery” atmosphere, safeguarding its wilderness and “sense of place” attributes, within a zonation and management framework that ensures that the character, beauty, diversity and integrity of the NNP is maintained, and that visitors have an exceptional experience.

6.1.2. Vision

To provide for present and expanding high quality eco-friendly tourism opportunities through good planning, zonation, management and collaboration between the conservation and tourism sectors, to help raise awareness and educate visitors about the NNP, desert and coastal environments, and to promote investment opportunities for all Namibians, particularly those previously excluded from the tourism sector as envisaged in the MET’s Concessions policy and the Tourism Transformation Charter.

6.1.3. Strategies

a) Develop a detailed “Tourism Plan” for the NNP that includes a feasibility assessment, sets carrying capacities, management actions and tourism impact monitoring within the context of the Park’s zonation plan. The plan should address the following components:

- Take full cognizance of the environmental sensitivities and biodiversity values of the area and its zonation, and strive to enhance, but never diminish these.
- Take full cognizance of the “Desert Discovery”, wilderness and “sense of place” attributes which the NNP has adopted.
- Take full cognizance of the rights and livelihoods of local communities and neighbouring residents in the area.
- Promote diversity of multiple market tourism, but with an emphasis on promoting low impact “Desert Discovery” tourism packages.
- Provide affordable tourism access to the NNP, particularly for Namibians.
- Make special provision for opportunities for community participation in the tourism development of the NNP. In this regard, the MET’s Concessions policy will apply.
- Place special consideration on promoting broad-based Black Economic Empowerment and involvement in the tourism development of the NNP. .
- Make provision (as incentives) for neighbours practicing compatible land uses to obtain concession into the park, thereby cementing commitments to co-management and open landscape approaches.
- Establish Concession Areas for Educational 4x4 Desert and Coastal Trips, wilderness and walking trails, accommodation facilities, etc.
 - Focus should be on high financial return, low impact tourism in the more remote areas.

- Explore potential of small high end-of-market lodges on eastern edge of area.

An important principle in this regard, is that a concessionaire may not sub-contract or sub-lease his/her concession to a third party. If the person to whom the concession was awarded cannot use it as stipulated, the concession will automatically revert back to MET, who will then re-allocate it to someone else or decline to re-allocate it, as the case may be.

- Develop an open air museum and Information Centre in Sesriem / Sossusvlei area.
 - Develop appropriate tourist maps of the Park and relevant information materials.
- Prepare and disseminate maps and information on the ecology, biodiversity, sensitivity, zonation and regulations of the NNP.
 - Develop agreed procedures and conditions for the various concessions.
 - Aerial zonation, heights and no-flying zones to be determined and form part of the zonation and tourism plan.
 - Ensure that tour guides are well trained, motivated and well tuned to visitor's needs and local conditions.
 - Ensure that the role and authority of Honorary Wardens are well publicized.

6.1.4. Activities

Actions	Timing	Record of progress
1. Develop a detailed Tourism Plan	2014	
2. Develop agreed procedures and conditions for the various concessions	Late 2014 and ongoing	
3. Design phased implementation mechanisms for the Tourism Plan	2015 and implement in phases	
4. Set standards for tour operators and guides	From time to time	
5. Prepare and disseminate maps and information, and establish good quality sign boards throughout the area	2014	
6. Establish monitoring system to track and document tourism numbers, activities, impacts, etc.	As necessary	
7. Explore the feasibility of developing an open air museum and Information Centre in Sessriem /Sossusvleis area.	2015	

7. Infrastructure

7.1. Development guidelines

7.1.1. Principle

All management and development decisions and activities within the NNP should be based on the principle of Sustainability and on the Precautionary and Polluter Pays Principles.

7.1.2. Vision

All developments and activities within the NNP will be guided by the sensitivity of the environment and by the unique and unusual opportunities that the environment offers for innovative developments and activities.

In addition, such developments and activities will be conducted in an environmentally sensitive manner according to best available practices as required by national law, international standards and high environmental principles and ethics..

7.1.3. Strategies

Infrastructure developments included in these guidelines include the following:

- Power lines and pipelines
- Railway tracks
- Communications towers.

Other types of infrastructure are addressed specifically in subsequent sections (7.2 – 7.8)

- a) Foster an environment in which all players (MET & MFMR staff, other ministries and parastatals, local communities, business operators and visitors) are encouraged to be innovative and fully committed to the highest ideals of sustainable development, ecosystem and landscape integrity, and to create the lightest possible “footprint”.
- b) Apply best environmental practices, including existing and evolving EIA and strategic assessment approaches to all developments in the NNP that are likely to have a significant impact.
- a) Apply Namibia’s Eco-Awards guidelines and criteria to the development and management of all tourism initiatives and developments – both infrastructure and activities.
- b) Develop a list of priority issues (e.g. prospecting and mining, road development, tourism activities, waste disposal, water use) for which specific guidelines (policies) should be systematically developed, and ensure that they are fully understood and implemented by relevant staff and stakeholders.

7.1.4. Activities

Actions	Timing	Record of progress
1. Locate, be familiar with and use best practice policies and guidelines,	2014 and ongoing	

including strategic assessment, EIA and Eco-Awards materials		
2. Develop specific guidelines and policies for priority issues	2012 and ongoing	
3. Ensure staff are familiar with and implementing the guidelines to appropriate standards	2012 and ongoing	

7.2. Access and roads

7.2.1. Principle

A minimal, practical, ecologically and aesthetically appropriate road network should be maintained to help achieve the objectives of the NNP.

7.2.2. Vision

Rationalise and maintain a road network to serve the management (including monitoring and research) and tourism needs of the NNP.

Close and rehabilitate obsolete roads. No new roads will be developed without strong rationale and EIA, and no off-road driving will occur except in areas clearly designated and zoned for this purpose, e.g. coastal and dune concessions.

7.2.3. Strategies

- a) A carefully selected network of roads will be maintained for the effective management of the park and approved tourism activities.
- b) Existing roads, tracks and borrow pits not forming part of the network will be closed and rehabilitated.
- c) Any new roads and associated infrastructures (e.g. borrow pits) will be subject to an EIA.
- d) Park officials and Honorary Wardens will be vigilant in preventing off-road driving where it is not allowed, and will enforce the regulations that prohibit it.

7.2.4. Activities

Actions	Timing	Record of progress
1. Develop an accurate GIS-based map of current roads & tracks, including making use of aerial photographs	2014 and ongoing	
2. Develop a road network plan showing roads and related infrastructure to be retained or decommissioned and rehabilitated	2014	
3. Close off unneeded roads	From 2011	

4. Rehabilitate closed roads, tracks and old borrow pits	2014 onwards	
5. Any new roads, borrow pits, etc to be subject to EIA	Ongoing	

7.3. Buildings

7.3.1. Principle

Buildings are required to accommodate the needs of management staff and tourists, and as support infrastructure for management functions. All buildings in the Park should be simple, functional, and with minimal footprint and visual impact.

7.3.2. Vision

Buildings are kept to a minimum, and are designed to be visually attractive, energy efficient and in keeping with the sense of place of the surrounding area. No buildings are constructed in conservation priority areas (Section 4.3) in the NNP.

7.3.3. Strategies

- a) Where buildings are required by non-MET authorities in the Park, they should be located as close to existing services and roads as possible.
- b) All structures (including non-permanent ones) must be designed and constructed to create minimal visual impacts.
- c) Planning for buildings should take into account the long-term management costs and servicing and maintenance responsibilities.
- d) Conservation staff should be concentrated near areas where management and control demands are highest, and ideally near to services. Non-essential staff should be accommodated near the periphery of the park.
- e) Structures containing fuel, gas and oil must meet national requirements and containment structures must be erected to minimize the effects of leaks and spillages.
- f) No billboards (that advertise products or services) will be allowed anywhere in the NNP.

7.3.4. Activities

Actions	Timing	Record of progress
Buildings to be constructed in the Park are discussed at the Consultative Forum and approved by MET before going ahead.	Ongoing	

7.4. Tourism infrastructure

7.4.1. Principle

Tourism infrastructure and facilities should be established to promote the environmental and outdoor assets of the Park, without compromising alternative and future use of the resources.

7.4.2. Vision

Tourism and recreation facilities in the Park are aligned with the area's sense of place, sustainable use of the resources, and respect for the wishes of other visitors to the Park.

7.4.3. Strategies

- a) All structures (including non-permanent ones) must be designed and constructed to create least visual impacts.
- b) Apply Namibia's Eco-Awards guidelines and criteria to the development and management of all tourism initiatives and developments.

7.4.4. Activities

Actions	Timing	Record of progress
Proposed tourism infrastructure and facilities are discussed at the Consultative Forum and approved by MET before going ahead.	Ongoing	

7.5. Airstrips and aircraft

7.5.1. Principle

Aerial tourism such as scenic flights over the dunes and along the coast, and fly-in transport to specific lodges, add value to NNP's tourism products. These aspects should be promoted within a framework of Namibia's civil aviation regulations, safety, sense of place and minimal disturbance to wildlife and people.

7.5.2. Vision

Aerial tourism in fixed wing aircraft is promoted, and carried out responsibly so that negative impacts such as disturbance of birds (e.g. in coastal wetlands) does not occur. Hot-air ballooning is also permitted in the Park under strict regulations. Airstrips in the Park are well maintained and civil aviation regulations are closely adhered to so that safety is never compromised and accident risks are minimized.

7.5.3. Strategies

- a) The „no-flying“ restriction below 1,000 m should remain applicable over the entire Park, with the exception of designated corridors for approved airstrips.

- b) Flights over Sandwich Harbour should be prohibited except for emergency or nature conservation purposes.
- c) Civil aviation representatives should be on the Consultative Forum. They should be made aware of the Park's flying restrictions and assist in apprehending and preventing non-compliance.
- d) No low-level flights should be permitted. Honorary Wardens and MET/MFMR staff should be able to report flying contraventions to local Civil Aviation authorities for quickly apprehending the responsible pilots.
- e) Noise pollution to other Park users must be considered in any flying operations.

7.5.4. Activities

Actions	Timing	Record of progress
Appoint a representative from the Dept of Civil Aviation to the Consultative Forum.	2012	
Channels of communication should be improved so that low-level flights and other contraventions can be reported to MET and Civil Aviation authorities by the public, Honorary Wardens and MET / MFMR staff. Repeat offenders should have their flying licence suspended.	Ongoing	

7.6. Waste management and pollution

7.6.1. Principle

The overall principle is that no pollution from wastes should occur in the NNP. Different types of waste should be treated as follows:

- Biodegradable household waste should be dumped in a designated site and allowed to decompose without causing nuisance effects to people and wildlife.
- Sewage from accommodation establishments should be properly treated in appropriate sewage facilities.
- No non-biodegradable solid waste should be disposed of in the Park.
- Domestic solid waste such as bottles, plastics, tins and paper should be transported out of the park to the nearest designated authorized landfills.
- This also applies to hazardous wastes such as used oil, which should go to an authorized hazardous waste disposal site.
- Emergency pollution events, such as marine oil spills, should receive a safe, timely, effective and coordinated response in coordination with the responsible government ministries and the Emergency Management Unit.

7.6.2. Vision

Environmental pollution does not arise from poor waste management in the NNP. Littering and pollution from waste is discouraged by „carrot and stick“ strategies, encouraging proper disposal and enforcing compliance with vigilance and strong penalties.

7.6.3. Strategies

- a) Pro-actively undertake routine clean-ups so that people in the park see clean, litter-free surroundings.
- b) All visitors and operators of whatever activities in the Park should practice the principle of „take in – take out,“ and the prohibition of littering should be strictly enforced by Park officials and Honorary Wardens. In particular, wastes from shore angling (e.g. offal, unused bait, bottles) should not be left on beaches.
- c) Beach patrols by MET and MFMR officials should strictly enforce the regulations on littering.
- d) Public toilet facilities at various sites such as at angling beaches should be kept in a sanitary condition so that people are not discouraged from using them by dirty facilities. „Bush toilet“ practices should not leave any mess that degrades people’s outdoor enjoyment. During peak seasons (especially over the Christmas and Easter holidays) public toilet facilities and rubbish bins should be cleaned and refreshed at least every day (including public holidays and weekends). Lines of responsibility carried by the municipalities and MET/MFMR officials should be clearly defined for these duties.
- e) All visitors and operators (including MET) in the Park should encourage and practice the 3-R principles of waste **Reduction**, **Re-use** and **Recycling** wherever possible.

The strategies for different types of waste are as follows:

- f) Designated, fenced waste sites should be created for biodegradable household waste. Secondary pollution from wind-blown litter or from scavengers (such as crows, jackals and hyenas) should be prevented by adequate enclosure of the site. Because decomposition rates in this arid environment are very slow, decomposition of this waste should be encouraged by circulating some flow of grey water over the waste site on a daily basis.
- g) Septic tanks should be installed for water-borne sewage.
- h) Sites which generate domestic solid waste such as bottles, plastics, tins and paper should have a fenced repository area for storage of this waste before it is transported out of the park to the nearest designated authorized landfills.
- i) Workshops and fuel storage areas should be designed so that contamination from hazardous wastes is prevented. These wastes should be safely contained before transportation to an authorized hazardous waste site.
- j) Marine oil spills should be handled according to the directives of the Oil Spill Contingency Plan. There should be constant preparedness for an emergency of this sort.

7.6.4. Activities

Actions	Timing	Record of progress
Include regular clean-ups as part of scheduled park maintenance activities. Increase frequency of clean-ups during peak angling seasons.	2012 and ongoing	
Implement the Honorary Warden law enforcement system and ensure that HWs include anti-littering vigilance in their patrols.	2015 and ongoing	
Clearly define responsibilities for MET and MFMR, to ensure that routine cleaning of public rubbish bins and toilets is carried out, especially in popular areas during peak tourism periods.	2012 and ongoing	
Ensure waste landfills and repository areas are well secured against dispersal of wastes by wind and scavengers.	2012 and ongoing	
Arrange that trucks going to towns for supplies can carry wastes out of the park and dispose of them in authorized municipal landfills.	2012 and ongoing	
For the Oil Spill Contingency Plan, collaborate with the Emergency Management Unit in the Office of the Prime Minister, Directorate of Maritime Affairs in MWTC, and Benguela Current Commission, to be always adequately prepared for an oil spill emergency on the coast. This should include planning for access to remote areas of the coast by emergency teams.	2012 and ongoing	

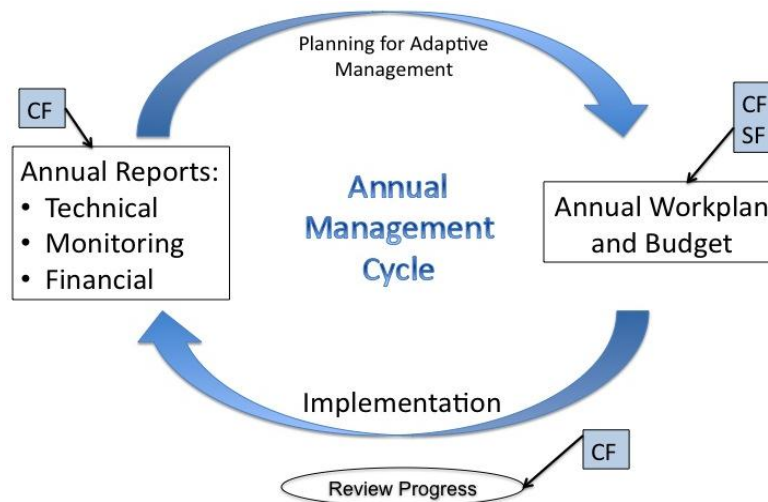
8. Administration and management

8.1. Management system

This PMP must be implemented in an efficient and systematic way. For each annual cycle, an Annual Work Plan and a Budget will be prepared. This work plan will, as far as practical, follow the sequence of topics listed under Sections 2 – 7 in the Plan. The work plan should cover:

- Routine management issues, such as managing water points, law enforcement, and extension work, etc.
- Development issues, such as tourism developments, wildlife reintroductions, etc.
- Monitoring activities, to collect, store, analyse and interpret information for adaptive management, covering such things as key biodiversity indicators, tourism and industrial impacts, etc.
- Research needs, based on the identification of priority information and knowledge gaps, with appropriate ways of implementing such research.
- Administration, including work plan & budget preparation, reporting and meetings.

Progress on the implementation of the annual work plan and a financial report against the approved budget should be presented at each Consultative Forum meeting. These will be standing agenda items, and the reporting format should follow the sequence of issues and timing of the work plan.



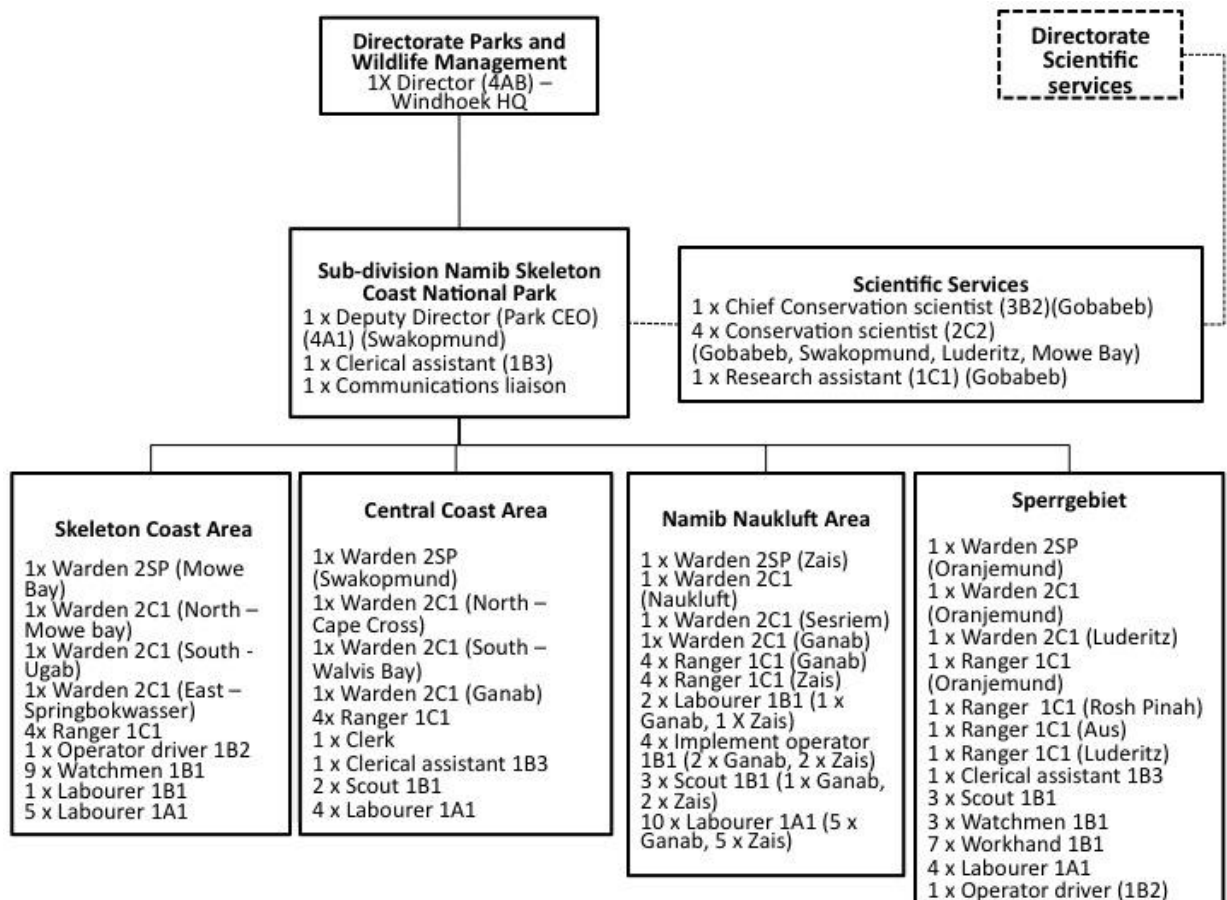
At the end of each annual cycle, an Annual Report and Financial Report will be prepared, plus a draft work plan and budget for the following year. The Annual Report will use the format of the work plan, and include cumulative (time-series) information from the monitoring programme. The cumulative information, showing trends over time, will be used to adaptively manage the Park. This information will also be used, together with the direction provided by the PMP, to prepare the next Annual Work Plan and Budget, both of which, together with the past year's technical and financial reports, will be tabled for review and adoption by the Strategic Forum.

8.2. Institutional arrangements

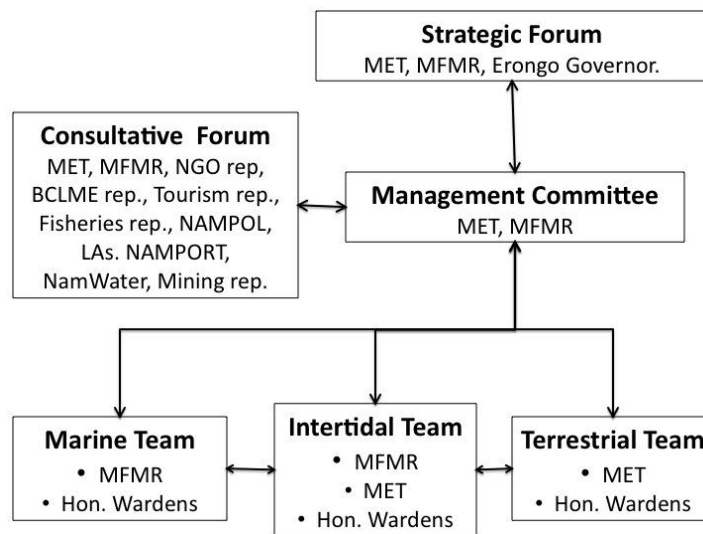
The marine component of the Namib Naukluft Park has not been proclaimed but it is intended that this will still occur. Nevertheless, the Ministry of Fisheries and Marine Resources is still responsible to join the MET in management of the NNP, as the land component does include the intertidal zone and some of the recreation in the park is focused on shore-based fishing.

Because the Park consists of marine and terrestrial components, the intertidal coastal zone, its biota and the species that transcend the marine / terrestrial interface are managed jointly by the MET and MFMR under agreed co-management principles and protocols that promote synergy, efficiency and elevated conservation management, monitoring and protection of habitats, processes and species. The intertidal co-management approach is a model of collaboration with clear benefits to the ecosystem and responsible institutions. Moreover, the two ministries shall jointly appoint Honorary Wardens who will assist with monitoring, surveillance, information dissemination, stakeholder engagement and law enforcement.

The proposed MET staff structure for the Coastal Parks appears below.



The management and decision-making structure for the NNP is as follows:



The Strategic Forum (SF) shall meet once a year, with the three institutions represented by Minister and Permanent Secretary level. The Erongo and Hardap Regions should be represented by the respective Governors and appropriate Councilors. The Chamber of Commerce at the coast shall select a person familiar with the business community interests at the coast, while NGOs at the coast will select a person to representative the interests of Namib-based conservation Civil Society organisations.

The SF will review and accept/reject/require changes to the park’s Annual Report and next years Work Plan, Budget and proposed amendments to the Management and Development Plan, all of which shall be delivered by the Management Committee. The Management Committee shall also serve as the secretariat of the SF, produce the agenda a month before the meeting and the minutes within one month of the meeting having taken place.

The Consultative Forum will play an advisory role, and should meet at least four times each year. Its membership is suggested in the organogram above, but this can be an inclusive structure that welcomes newcomers who may have insights and something to offer to the park in terms of ideas and support. This CF is the Park’s formal mechanism for consulting with key stakeholders and building an all-inclusive team approach towards park management and development. It also promotes a broad-based feeling of ownership about the park. The main purpose of CF meetings is to track progress towards meeting set objectives (e.g. annual work plan), solving problems and capitalizing on opportunities that may arise.

At the CF meetings, the representatives will brief each other on their activities and plans, and exchange views on how best their respective sector interests might be accommodated in the park, and how they may contribute to the management and development of the park. The Management Committee should „bounce ideas“ off the CF and their advice should be carefully considered. The Management Committee shall serve as the secretariat of the

CF, produce the agenda a month before the meeting and the minutes within one month of the meeting having taken place. Minutes of all CF meetings must be copied to the SF for their information.

The Management Committee (MC) is responsible for operational decision-making, and it shall consist of senior staff from MET and MFMR. Both ministries should include law enforcement, resource management and scientific services personnel on their teams. This committee must meet quarterly so that the co-management institutions are regularly in contact with each other, and it must strive to achieve integrated management, avoiding wherever possible sectoral conflicts and unnecessary „turf wars“ – their responsibility is **co-management**. The chairperson of the meetings shall rotate every year, with the institution chairing providing the secretariat. Minutes of all MC meetings must be copied to the DPWMC for sharing of information.

Given the specific national mandates for MET and MFMR, it is logical that the former will handle management on land (above high water mark) while the latter will manage the ocean component (below low water mark). The intertidal zone will require shared management on a roughly equal basis, depending on availability of personnel and other resources. It is important that there is complementarity between these institutions, NOT duplication and NOT competition. Suitably qualified MET personnel shall be empowered to enforce fisheries legislation, and suitably qualified MFMR personnel shall be empowered to enforce environmental, park and conservation legislation.

The **Honorary Wardens** (HWs) are an important component of the team, and the target should be 40 for the NNP, covering conservation, recreation and tourism, resource use, business and development components and neighbours. The HWs should be present/active in various locations in and neighbouring the NNP.

The HWs must receive appropriate training and be appointed for three years, renewable for further 3-year terms depending on their performance and commitment. The criteria for their selection include:

- Commitment to the conservation and management of the Park, and to assist the authorities in the implementation of this PMP.
- Knowledge of the coastal, desert, escarpment and/or marine environments.
- Knowledge of the law and successful completion of the required training.
- Integrity and good standing in society (law abiding and no criminal record).
- Presence in or adjacent to the area (regular traveler through the area, along its boundary, etc).
- Own transport (car, quad-bike, boat, aircraft, bicycle), communication means (e.g. cell phone), positioning equipment (e.g. GPS), digital camera and willingness to use them for the good of the Area and Park.
- Ability to deal with people firmly but fairly, including law-breakers.

- Team player.

The Honorary Wardens shall have the following powers:

- To provide information on the PMP, zonation and regulations of the NNP .
- To inform people who break the law that they are in contravention of the above, and request them to immediately comply.
- To stop a person and search a vehicle, boat or aircraft, providing there is a reasonable suspicion that the person has been involved in an illegal activity.
- To demand a person’s name (as above).
- To inspect a suspect’s luggage (in search of any illegal items, such as fish, shellfish, bait, venison, live animals, plants, etc.).
- To count and/or measure fish or shellfish to determine if they comply with legal requirements.
- To confiscate any items found to be illegal – and to then issue a confiscation receipt to the offender and to store the confiscated items in a safe place.
- To issue an offender with an official warning.
- To report an offender to the authorized law enforcement agencies, whose task it is to perform an arrest/fine as the case may be.

Actions	Timing	Record of progress
1. Establish the Directorate Parks and Wildlife Management Committee and agree on the TORs	mid 2014	
2. Prioritise areas, issues, species requiring co-management approaches, and agree on areas, issue, species that should rather be managed sectorally	Mid 2014	
3. Establish practical and efficient operating procedures for collaboration, communication and reporting.	Mid 2014	
6. Through the offices of the respective PSs of the two ministries, appoint Honorary Park Wardens, provide them with TORs and relevant training and issue them with IDs, operating procedures and warning and confiscation books.	End 2014	

8.2.1. Activities

Actions	Timing	Record of progress
1. Establish the Strategic Forum and agree on their TORs	Early 2013	
2. Establish the Management Committee and agree on their TORs	Early 2013	
3. Establish the Consultative Form and agree on their TORs	Mid 2013	
4. Prioritise areas, issues, species requiring co-management approaches, and agree on areas, issue, species that should rather be managed sectorally	End 2013	
5. Establish practical and efficient operating procedures for collaboration, communication and reporting.	End 2013	
6. Through the offices of the PS of the two ministries, appoint Honorary Park Wardens, provide them with TORs and relevant training and issue them with IDs, operating procedures and warning and confiscation books.	End 2013	

8.3. Record keeping

8.3.1. Annual work plans

Each year's work plan must be filed under this section.

The annual work plan consists of a simple matrix that states:

- What should be done,
- When should it be done, and
- Who should do it.

These activities are derived from the PMP and follow the sequence of actionable topics under Sections 2 - 7. They are best divided into five categories

- Routine management issues,
- Development issues,
- Monitoring requirements,
- Research priorities and
- Administration of work plan

Example of Annual Work Plan

Namib Naukluft Park Annual Work Plan for 20__													
Activities	J	F	M	A	M	J	J	A	S	O	N	D	Responsible
Routine management													
1.													
2.													
3.													
4.													
Etc.													
Development issues													
1.													
2.													
3.													
4.													
Etc.													
Monitoring aspects													
1.													
2.													
3.													
Etc.													
Research priorities													
1.													
Etc.													
Administration of work plan													
1. Park CF meeting - progress report		*					*				*		Committee
2. Adopt w/plan & budget for next year											*		Committee
3. Annual technical report from past year		*											Committee
4. Annual monitoring report (feed into w/p)		*					*				*		Committee
5. Etc.													

Agendas and Minutes of NNP Strategic Forum meetings

The agenda and minutes of each Strategic Forum meeting, plus the Terms of Reference for this Body, must be filed under this section.

Agendas and Minutes of NNP Consultative Forum meetings

The agenda and minutes of each NNP Consultative Forum meeting, plus the Terms of Reference for this Forum, must be filed under this section.

Annual reports

Each annual report for the NNP should be filed under this section.

Amendments/changes to the NNP PMP

Any changes to Sections 2 - 7 of the PMP must be recommended at a formal PMP Consultative Forum meeting and approved by the PMP Strategic Forum, and such changes must be formally reflected in the minutes. Copies of the relevant sections of the minutes must be filed under this section of the Plan.

All changes must be entered into the "Record of Management Plan Updates" (see table below) and the amended section(s) circulated to the people/offices listed below, with a completed Record of Management Plan Updates form.

Example of Record of Management Plan Updates

Update number	Date	Page/s removed	Page/s inserted
1			
2			
3			

Original copies of the PMP

The following will be provided with original copies of the PMP and its updates:

- NNP Warden and staff
- Chief Warden, Coastal Parks Complex
- Dorob National Park Management staff
- Skeleton Coast National Park Management staff
- Sperrgebiet National Park Management staff
- Parks Deputy Director, Windhoek
- Parks & Wildlife Director, Windhoek
- MET Library, Windhoek
- Office of the MET PS, Windhoek
- Offices of the PSs of MME, MFMR, MLR, MAWRD, MLRGHRD
- Office of the MET Deputy Minister, Windhoek
- Office of the MET Minister, Windhoek
- MME offices (Swakopmund / Central Coast) & Geological Survey
- MLR office (Swakopmund / Central Coast)
- MFMR (Swakopmund / Central Coast)
- Office of the Governor – Erongo and Hardap, and Councilors
- Municipality authority offices – Swakopmund and Central Coast
- Chamber of Commerce & Industry, Central Coast
- Relevant NGOs
- FENATA
- Gobabeb Training and Research Centre
- Topnaar Community
- Any other stakeholder that requests a copy
- Pdf copy on the MET website

8.4. Annual budget

This is based on a “zero budget” approach, and is aimed at making maximum sustained impact in the most cost effective and efficient ways. The budget should closely follow the contents of the Annual Work Plan. It essentially aims to allocate financial resources to ensure that the work plan is effectively implemented. A standard budget format should be developed that allows for smooth and simple integration with the budgets for other Parks in the region, and then at the national level.

Example of an annual budget for the NNP

Namib NaukluftPark				
Annual budget for 20 __				
Budget line items	Unit cost (N\$)	No. Units	Total (N\$)	Notes
1. Staff remunerations				
1.1 Park Warden				
1.2 Chief ranger	Xxx/month	12 + 1		1
1.3 Rangers x 3	Yyy/month	12 + 1		2
1.4 Labourer x 3	Zzz/month	36 + 3		3
1.5 Casual labour	Aaa hours	Bb hours		4
1.6 Social Security				5
1.7 Medical aid				6
1.8 Rations				7
1.9 etc				8
1.10 Consultancy services	Xxx/days	Yy days/yr		9
2. Transport				
2.1 Vehicle fuel	Xxkm/mnth@yy/km	12		10
2.2 Vehicle maintenance				11
2.3 Licence, etc,				12
3. Equipment				
3.1 Chainsaw	xxx	1		13
3.2 etc				14
4. Building materials				
4.1 Cement				15
4.2 etc				16
5. Co-management support				
6. Monitoring				
7. Research				
6. Information sharing and dissemination				
7. Rehabilitation				
8. Administration				

Comprehensive notes should accompany the budget so that a person not familiar with the NNP would understand the logic of how resource allocation has been determined and calculated.

Example of Budget Notes

No.	Budget Notes
1	
2	
3	
4	
Etc	

A copy of each annual budget should be filed under this section.

8.5. Financing

8.5.1. Principle

A significant component of the financial resources required to effectively implement this PMP are raised from within the NNP through levies, concession fees, fines, donations and other sources. These funds are held, administered and deployed under the local control of the DASS, using transparent and accepted accounting practices.

8.5.2. Vision

To raise, administer and apply funds for the implementation of this PMP. This would include:

- exploring and implementing appropriate mechanisms for resource collection and mobilization,
- establishing and implementing financial administration and management systems under the jurisdiction of the DASS and applying transparent and accepted accounting practices,
- establishing procedures for the DASS to review, discuss and approve fund deployment for legitimate activities towards the implementation of the PMP,
- reporting on funds received and expended, and on the outputs, outcomes and impacts of the actions funded.

8.5.3. Strategies

- a) Initiate a discussion between MET, MFMR, Ministry of Finance on mechanisms to raise, hold, administer, manage and apply funds, for the implementation of the PMP.
- b) Based on the outcome of the above, establish the necessary financial management procedures, accounts and processes required to ensure good transparent financial accounting and reporting.

8.5.4. Activities

Actions	Timing	Record of progress
<ul style="list-style-type: none"> • Initiate a discussion with MoF on procedures for raising, holding, administering and applying funds 	Start in mid 2014	

locally for this PMP.		
• Plan next steps based on the outcomes of the above discussions	Following on from above	

9. Bibliography

9.1. Background information

This is a very dynamic part of the PMP, and should be added to and updated as information becomes available. The following topics, which may be added to, are relevant:

- Geographic location, coverage and topography (maps)
- Climate
- Geology & geomorphology
- Paleontology
- Hydrology
- Ephemeral river systems, vleis and pans
- Ground water
- Broad habitats
- Flora
- Mammals
- Birds
- Reptiles
- Amphibians
- Fishes
- Coastal and marine fauna
- Terrestrial invertebrates
- Endemic species and patterns of distribution
- Red Data species
- Alien species
- Archaeology
- History
- Land use, past and present
- Infrastructure
- Administration
- Legal issues

Information for this section should be obtained opportunistically, by Park staff, informed visitors, by attracting visiting scientists, and by working with universities and other interested organisations and individuals.

New information may have management implications. Such information, where relevant, should be tabled at NNP DPWMC meetings. New information may lead to recommendations for changes in aspects of monitoring and management.

9.2. Studies and reports

This is also a dynamic part of the PMP. As the results of studies, reports and publications on the NNP and relevant adjacent areas and topics are completed and become available, their full citation should be listed here, with

author, date, title and reference. Copies of the reports and publications should be kept at:

- a) The MET library in Windhoek,
- b) The NNP HQ , and
- c) Gobabeb Training and Research Centre

Example of Report and Publication List

List of Reports and Publications from and relevant to the NNP				
No.	Author(s)	Date	Title	Reference
1	Seely, M.	2012	Namib Sand Sea World Heritage Nomination	
2				
3				
4				

TOPNAAR TRADITIONAL AUTHORITY

CHIEF SETH KOOTJIE

P. O. BOX 2041

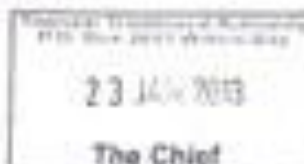
WALVISBAY

NAMIBIA

TEL/FAX: 064-207103

CELL: 0812775899

Email: seth.kootjie@gmail.com



Protocol 1988/7/27

Reg: No T29783

The Director
World Heritage Centre
UNESCO
7, Place de Fontenoy
75352 Paris 07 SP
France

23 January 2013

Dear Dr. Rao

Namib Sand Sea World Heritage Nomination

The Topnaar Traditional Authority through the Topnaar Traditional community of Namibia supports the nomination of the Namib Sand Sea as world heritage and will welcome inscription. The Topnaar Traditional Authority furthermore undertakes to encourage current and future generations of Topnaar Community to continue managing their traditional resources in and around the Namib Sand Sea according to the principles handed down from their ancestors customary laws.

Yours sincerely

Chief Seth Kootjie
23 JAN 2013
The Chief



REPUBLIC OF NAMIBIA

MINISTRY OF ENVIRONMENT AND TOURISM

**NATIONAL POLICY ON PROTECTED AREAS,
NEIGHBOURS AND RESIDENT
COMMUNITIES**

JANUARY 2013

FOREWORD

Namibia has a well-developed network of protected areas that makes a major contribution to the conservation objectives contained in the country's development goals. However, these national parks and game reserves has for many years remained largely separate from the people who live around their borders or within the parks themselves. As a result there are often negative impacts on the habitats and wildlife conserved by the protected areas because neighbours are hostile to the parks. Further, the considerable economic opportunities that protected areas offer have in the past remained outside the reach of local communities and local entrepreneurs.

People living in or next to protected areas often suffer losses from wildlife such as predators that kill livestock or elephants that damage crops and property. Most protected areas were established on land that in the past was occupied by people and many park neighbours today have cultural associations with areas within the parks.

Namibia's protected area network makes significant contributions to the conservation of biodiversity which is of national and international importance and contribute to the maintenance of ecosystem services as well as contributing to the socio economic benefits of local communities who are neighbours or/and residents of such protected areas. It is important to create positive attitudes of residents and neighbours towards protected areas and capitalize on sound management with them to enhance conservation activities.

It is for these purposes that a detailed policy has been developed to provide guidelines on the involvement of neighbours and resident people in protected area management and benefits thereof, while at the same time recognizing the need to promote biodiversity conservation.

**Uahekua Herunga, MP
MINISTER**

PREFACE

The establishment and existence of Protected Areas, is the cornerstone of conservation in Namibia and has a long and respected history. In some part of the country, protected areas were established with little recognition of local community rights and traditions, and are managed to exclude consumptive uses or limit human activities. It is therefore important that these protected areas provide social, economic and cultural benefits to neighbours and residents of such areas.

The scale and urgency of the matter require Government to develop an integrated, flexible and comprehensive policy towards dealing with neighbours and residents to protected areas that can provide a framework for all stakeholders and can meet the country's national and international commitments to biodiversity conservation while taking into account the rights and development needs of its people.

This document sets out the Government policy on protected areas, neighbours and resident communities. The strategies to implement the policy provides the content for this document and include engagement with neighbours and/or residents of protected areas, promoting socio-economic development, landscape conservation and zoning of protected areas, liaison and communication, transfrontier conservation and ecosystem management across larger landscapes.

This policy has been developed through consultations with a broad range of stakeholders that include traditional authorities, communal area farmers, freehold farmers, conservancies, Government officials in various ministries, Non-Governmental Organizations and researchers. The policy is based on the ideas and experience of these stakeholders and of officials of the Ministry of Environment and Tourism over many years. The Ministry of Environment and Tourism would like to thank all its partners and stakeholders who participated in developing this policy.

Erica Akuenje
Acting Permanent Secretary

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ABBREVIATIONS

MET	Ministry of Environment and Tourism
NGO	Non Governmental Organization
TFCA	Transfrontier Conservation Area
TFP	Transfrontier Park

1. INTRODUCTION

Most of Namibia's protected areas were proclaimed before Namibia's Independence in 1990 and have been maintained as islands of conservation separated from surrounding communities, their land uses and local economies. This policy sets out a vision of how Namibia's protected areas can contribute not only to conservation, but also to other national development goals such as economic development, and how the protected areas can benefit the people who are neighbours to these areas or who are resident within them.

Protected areas are set for the propagation, protection, study and preservation therein of wild animal life, wild plant life and objects of geological, ethnological, archaeological, historical and other scientific interest and for the benefit and enjoyment of the inhabitants of the territories and other persons. These are significant national assets, not only because of contribution to GDP but also for those living in and around them.

The Nature Conservation Ordinance, 1975 (Ordinance 4 of 1975) as amended by the Nature Conservation Amendment Act (Act 5 of 1996) provides legislative basis for protected areas, neighbours and resident communities.

Provision will accordingly be made in any legislation which shall repeal the Nature Conservation Ordinance, as amended, for a proper administrative, legal and procedural framework for protected areas, neighbours and resident communities.

2. POLICY FRAMEWORK

Where it is in the interests of improved conservation and promotion of national development goals, the Government will engage and closely work with protected area residents and/or neighbours or other relevant stakeholders, giving particular attention to promoting their socio-economic development and their involvement in the conservation, planning and development of the protected areas.

2.1 Aim

The aim of the Policy is to contribute to the improvement of conservation efforts of Namibia's protected areas, provide greater social equity in accessing benefits from protected areas and stimulate local economic development through creating business opportunities linked to protected areas.

2.2 Objectives

- 2.2.1 To define and strengthen the relationship between protected areas, neighbours and resident communities.
- 2.2.2 To promote management of natural resources with protected area neighbours across larger landscapes, including Transfrontier Conservation Areas (TFCA)

and Transfrontier Parks (TFP), for enhanced ecosystem conservation and socio-economic development.

- 2.2.3 To provide a framework for zoning of protected areas for different land uses in order to accommodate the development needs of resident communities.
- 2.2.4 To create improved communication and enhance mutual understanding between park management authorities, neighbours and resident communities.
- 2.2.5 To meet the country's national and international commitments to biodiversity conservation while taking into account the rights and development needs of the people.

3. Principles

The Policy is based on the following fundamental principles:

- 3.1 Protected areas are the cornerstone of Namibia's conservation programme and will continue to play an important role in the conservation of ecosystems, essential ecological processes and biological diversity.
- 3.2 Protected areas also have the potential to provide important economic benefits, locally, regionally and nationally. This policy recognizes the Government's emphasis on rural development and protected areas should be managed to provide the possible benefits to residents and neighbours within the limits of ecological and economic sustainability.
- 3.3 Communities living in or adjacent to protected areas often have long-standing relationships with the land in these areas which should be acknowledged and respected.
- 3.4 Where it is in the overriding interests of conservation that people residing in a protected area should be relocated from that area, through appropriate structures and consultations, they should be provided with alternative access to productive land and support to re-establish themselves in their new locations.
- 3.5 The rights of resident communities and neighbours to food security through agriculture based enterprises in multiple use areas and areas adjacent to parks are acknowledged.

4. Strategies

In order to implement the policy on Protected Areas, Neighbours and Resident Communities, a number of linked and integrated strategies are required. The following are the main strategies aimed at achieving the aim and objectives of the policy:

4.1 Engagement of neighbours and/or residents of Protected Areas

The specific objectives of this strategy are:

- To define the rights, benefits, access, duties and obligations of the neighbours and/or residents to protected areas, as may be appropriate and in the best interests of conservation.

- To define any restrictions on the activities of people residing in protected areas.

Strategic approach

Where appropriate, the Ministry will engage with neighbours and/or residents of protected areas on activities that define the relationship between these neighbours and/or residents, the protected area and the park management, and which define the ways in which they will benefit from the park, contribute to its management objectives, and the nature of interactions between the parties involved. Any such engagement or interactions shall be approved by the Minister.

Where it will promote improved conservation and/or improved relationships with protected area residents or neighbours, the Ministry will engage and closely work with protected area residents and/or neighbours through their existing structures. This engagement strategy will provide for the sustainable management of certain human activities, wildlife and/or wildlife habitats within a protected area, and/or the adjacent land units that form part of the engagement.

4.2 Promoting Socio-economic development

The specific objectives of this strategy are:

- To provide possible benefit for people whose lives are impacted or affected by protected areas, provided that i) these benefits are ecologically and economically sustainable and ii) these benefits are in accordance with the objectives of a particular protected area as defined in the management plan.
- To develop protected areas in support of economic growth and development in the regions where they are located.

Strategic approach

Appropriate economic opportunities will be provided to protected area residents and neighbours in accordance with the Government's Policy on Tourism and Wildlife Concessions on State Land.

Protected areas will be integrated into local and regional economies through:

- Serving as core areas of protection from which wildlife can move into adjacent areas for sustainable use and tourism activities by neighbours such as communal conservancies.
- Providing incentives for the development of wildlife and wildlife-based tourism activities on land adjacent to protected areas.
- Providing employment opportunities for people living in or adjacent to the protected area.

- Encouraging and supporting the development of local tourism-based enterprises.
- Encouraging residents to form representative bodies in consultation with their traditional authorities to ensure effective communication with MET.
- Endeavour to provide sufficient and suitable space for healthy living conditions and social amenities for residents, and access to all normal social services, recognizing however, the benefits of peripheral development.

4.3 Landscape conservation and zoning of protected areas

The specific objectives of this strategy are:

- To provide for demarcation of protected areas with resident communities in zones for different levels of use and in particular to accommodate the residential areas and developmental needs of resident communities.
- To promote and encourage landscape conservation in order to ensure that land uses in areas adjacent to existing protected areas are compatible with biodiversity conservation objectives, and corridors are established to sustain the viability of wildlife populations.
- To lift the barriers to promotion of large scale network of landscape conservation and address threats to habitat and species loss on a landscape level approach so as to ensure greater responsiveness to variability and seasonality issues around climate change.

Strategic approach

Where appropriate, protected areas with resident communities can be zoned for different levels of use, including core areas, multiple use areas, and residential areas which can be used to reduce conflict with residents and/or neighbours and to allow resources in the park to be used for socio-economic benefit in a regulated manner.

Landscape conservation to areas adjacent to protected areas should be promoted where appropriate.

MET will support the development of wildlife-based economic opportunities and promote other enterprise opportunities linked to the protected area, promote compatible forms of land use through institutions such as conservancies, community forests, tourism enterprises and assist neighbours and resident to protected areas with human wildlife conflict management in terms of the Government's National Policy on Human Wildlife Conflict Management and any other relevant policies, legislation or directives of the Government.

Through landscape conservation, MET will work closely with neighbours and resident communities and other stakeholders to manage wildlife, combat wildlife crime, prevent wild animals and livestock diseases, and provide environmental education, community

awareness programme and training, and support game monitoring and research.

The nature of landscape conservation will vary according to the circumstances of each protected area.

MET will ensure that all sectors work together through an integrated approach and that participatory approaches through landscape conservation can lead to better conservation and sustainable livelihoods.

Landscape conservation areas will adopt a landscape level conservation approach that goes beyond protected area boundaries or communal conservancies by viewing landscapes as ecological blocks. This approach will improve the returns per unit of investment in protected areas by spreading conservation management, and benefits across a wider scale.

4.4 Liaison and communication

The specific objective of this strategy is to strengthen management of certain activities with resident communities and/or neighbours through regular communication and liaison.

Strategic approach

Liaison and communication with residents in or adjacent to protected areas will take place on a regular basis in order to address problems and conflicts, share information, and implement sustainable management of wildlife resources. Such liaison, for example the Park Advisory Committee for a specific protected area, should have clear terms of reference.

Protected area staff should also carry out regular contacts with residents and/or neighbours in order to promote good relationships and the regular exchange of information.

4.5 Transfrontier conservation and ecosystem management across larger landscapes

The specific objective of this strategy is to promote sustainable management of certain activities with protected area neighbours across larger landscapes, including transfrontier conservation areas and transfrontier parks for enhanced ecosystem conservation and socio-economic development.

Strategic approach

Protected areas often do not encompass whole ecosystems and the range of wildlife in protected areas often seasonally covers land outside these areas. In order to enhance ecosystem conservation and in order to maximize socio-economic benefits MET may

establish partnerships and appropriate institutional mechanisms with neighbouring States and wildlife authorities to identify appropriate land units for better management of shared natural resources that straddle the international borders and drive equitable socio-economic benefits through sustainable use. In some cases, this will provide links between isolated protected areas.

Where MET is collaborating with conservation and tourism agencies in neighbouring States on the development of transfrontier conservation areas and transfrontier parks, it will promote the harmonization of policies, strategies and practices for the involvement and benefit of resident and neighbouring communities, and for the benefit of all citizens and the country in general. Such transfrontier conservation areas and transfrontier parks will be established through a treaty.

5. Institutional Framework

- 5.1 The Ministry of Environment and Tourism is the coordinating and leading institution in the implementation of this Policy.
- 5.2 Traditional authorities, communal and freehold neighbours and/or residents, communal area conservancies, line Ministries, Regional Councils, the private sector and NGOs, will, in practical terms and where appropriate, support these strategies by implementing programmes and projects together with the Ministry.
- 5.3 Where relevant and appropriate, the NGOs and private sector will be invited by the MET to become involved in the provision of planning, training, extension services, material inputs to resident communities and neighbours of protected areas.

6. Monitoring and Evaluation

- 6.1 The impact of the implementation of this policy and progress, and constraints regarding its implementation will be periodically assessed by the Ministry of Environment and Tourism, and where necessary in consultation with other stakeholders.
- 6.2 The engagement with resident communities and neighbours, concessions awarded in protected areas, Event/Incident Book system and other activities of the communities and relevant stakeholders will be used for monitoring and evaluation of this policy.

BIBIOGRAPHY

1. Government Gazette. 1996. Nature Conservation Amendment Act, 1996 (Act 5 of 1996)

2. Government Gazette. 1975. Nature Conservation Ordinance of 1975 (Number 4 of 1975)
3. Ministry of Environment and Tourism. 2009. National Policy on Human Wildlife Conflict Management
4. Ministry of Environment and Tourism. 2007. Policy on Tourism and Wildlife Concessions on State Land

GLOSSARY

For the purposes of this policy, the words or phrases set out below have the following meanings:

Conservancy	Communal area conservancy gazetted in terms of the Nature Conservation Amendment Act (No.5 of 1996).
Core area	An area within a protected area or conservancy that is exclusively zoned for biodiversity conservation.
Human-Wildlife Conflict	Any event in which wild animals harm, destroy or damage human life or property (including damage to or destruction of crops), or in which wild animals are injured, captured or destroyed as a result of a perceived threat to humans or their property.
Government	Government of the Republic of Namibia.
Minister	The Minister of Environment and Tourism.
Ministry	The Ministry of Environment and Tourism.
Multiple use area	An area within a protected area that is zoned to support biodiversity conservation and other land uses of communities residing in such a protected area, as specified in the park management plan.
Landscape conservation	Compatible land use to biodiversity conservation in areas with a cluster of different land units which are potentially under different tenure. This refers to areas adjacent to protected areas.
Neighbours	Occupiers of communal land or freehold farms immediately adjacent to protected areas.
Protected Area	Formal protected area proclaimed in the Government Gazette according to the Nature Conservation Ordinance number 4 of 1975.
Resident community	People who are residing in a protected area and not the employees of the Ministry, line Ministries, Parastatals, Private companies and NGOs or any such person working on a temporally basis in a protected area. Resident community also include any persons who may be allowed to reside within a protected area in terms of any partnership

management agreement between the MET and the residents of that protected area.

Representative bodies

Structures formed to represent the interest of communities and private land holders in areas adjacent to protected areas, with clear terms of reference.

Stakeholder

Any individual, group of individuals, organization or Government department or agency that is affected by the management and existence of protected areas.

GOVERNMENT GAZETTE

OF THE

REPUBLIC OF NAMIBIA

R 19,50

WINDHOEK - 31 December 1992

No. 564

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GOVERNMENT NOTICE

No. 199	Promulgation of Minerals (Prospecting and Mining) Act, 1992 (Act 33 of 1992), of the National Assembly	1
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Government Notice

OFFICE OF THE PRIME MINISTER

No. 199

1992

PROMULGATION OF ACT OF THE NATIONAL ASSEMBLY

The following Act which has been passed by the National Assembly and signed by the President in terms of the Namibian Constitution is hereby published in terms of Article 56 of that Constitution.

No. 33 of 1992: Minerals (Prospecting and Mining) Act, 1992.

ACT

To provide for the reconnaissance, prospecting and mining for, and disposal of, and the exercise of control over, minerals in Namibia; and to provide for matters incidental thereto.

(Signed by the President on 16 December 1992)

BE IT ENACTED by the National Assembly of the Republic of Namibia, as follows:

ARRANGEMENT OF SECTIONS

PART I

Introductory provisions

1. Definitions.

PART II

Rights in relation to minerals

2. Rights in relation to minerals.
3. Prohibition on carrying on certain operations without licence, and transfer of certain licences or grant, cession or assignment of interests in such licences, and joinder of persons as joint holders of such licences or interests.

PART III

Administration of Act

4. Appointment of Mining Commissioner, and designation of other officers.
5. General powers of Commissioner.
6. Preservation of secrecy.
7. Prohibition of certain officers on holding certain interests in mineral licences or in companies holding mineral licences.
8. Limitation of liability.

PART IV

Minerals Board of Namibia

9. Establishment of Minerals Board of Namibia.
10. Functions of board.
11. Constitution of board.
12. Term of office and conditions of service of members of board
13. Vacation of office by members of board
14. Meetings of board and decisions.
15. Performance of administrative functions of board.

PART V

Provisions relating to non-exclusive prospecting licences

16. Rights of holders of non-exclusive prospecting licenses.
17. Persons who may apply for non-exclusive prospecting licences.
18. Applications for non-exclusive prospecting licences.
19. Powers of Commissioner in respect of applications for non-exclusive prospecting licences.
20. Restrictions on grant of non-exclusive prospecting licences.
21. Issue of non-exclusive prospecting licences.
22. Duration of non-exclusive prospecting licences.
23. Transfer or renewal of non-exclusive prospecting licences, and grant, cession or assignment of interests in such licences, and joinder of persons as joint holders of such licences or interests.
24. Records to be kept and returns to be submitted by holders of nonexclusive prospecting licences.

PART VI

Pegging of claims

25. Persons who may peg claims.
26. Restrictions on pegging of claims.
27. Limitations on pegging of claims.
28. Manner of pegging of claims.
29. Effect of pegging of claims.
30. Powers of Commissioner in event of failure by holders to comply with provisions of this Part or disputes.

PART VII

Provisions relating to mining claims

31. Rights of holders of mining claims.
32. Persons who may apply for registration of claims.
33. Applications for registration of claims.
34. Powers of commissioner in respect of applications for registration of claims.

35. Restrictions on grant of applications for registration of claims.
36. Registration of claims.
37. Duration of mining claims.
38. Applications for renewal of registration of mining claims.
39. Transfer of mining claims, and grant, cession or assignment of interests in mining claims, and joinder of persons as joint holders of such mining claims or interests.
40. Directions to holders of mining claims.
41. General terms and conditions of registration of mining claims.
42. Work programmes of prospecting operations and mining operations.
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PART I

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1. Definitions.

(1) In this Act unless the context indicates otherwise -

“accessory works” means any building, plant or other structure required for purposes of reconnaissance operations, prospecting operations or mining operations or for the disposal of any mineral or group of minerals won or mined in the course of any such operations, or is connected with such operations or disposal, including

- (a) any power plant, transmission line or substation;
- (b) any water borehole, well, pipeline, drilling rig, pump station, tank or dam;
- (c) any airfield, helicopter landing-pad, road, gate, rail or railway siding;
- (d) any workshop, hangar, store or office;
- (e) any explosives magazine;
- (f) any sampling plant, processing plant, smelter or refinery whether erected on land or constructed on any vehicle or vessel;

(g) any waste disposal site; or

(h) any camp site or temporary or permanent residential area;

“accredited agent” means a person designated in accordance with the provisions of section 121 as the accredited agent for the holder of a non-exclusive licence, mining claim or mineral licence, as the case may be;

“base and rare metals group” means, subject to the provisions of subsection (4), a group of minerals containing the elements specified in Part 1 of Schedule 1;

“board” means the Minerals Board of Namibia established by section 9;

“claim” means an area of land which has been pegged as a claim in accordance with the provisions of Part VI;

“claim area” means the area of land of a mining claim;

“Commission” means the Minerals Ancillary Rights Commission established by section 108;

“Commissioner” means the Mining Commissioner appointed under section 4(1);

“company” means—

(a) a company as defined in section 1 of the Companies Act 1973 (Act 61 of 1973) including an external company as so defined to which a certificate of registration has been issued in terms of section 322(2) of that Act; or

(b) a juristic person established by or under any law in force in Namibia;

“controlled mineral” means any mineral specified in the nuclear fuel minerals group, the precious metals group and the precious stones group, and any other mineral declared under subsection (3)(a) to be a controlled mineral;

“dimension stone group” means, subject to the provisions of subsection (4), a group of minerals containing rock material specified in Part 2 of Schedule 1;

“excavation” means any trench, pit, shaft or other open or underground working made in the course of prospecting operations or mining operations, as the case may be, excluding any superficial excavations made for purposes of geochemical soil and rock sampling;

“exclusive prospecting licence” means an exclusive prospecting licence issued under section 70 and includes the renewal of any such licence;

“good mining practices”, “good prospecting practices” or “good reconnaissance practices” means any practices which are generally accepted by persons involved in mining operations, prospecting operations or reconnaissance operations, as the case may be, in other countries of the world as good, safe and necessary in carrying out any such operations in relation to a mineral or a group of minerals;

“group”, in relation to minerals, means the precious metals group, the base and rare metals group, the precious stones group, the semiprecious stones group, the industrial minerals group, the dimension stone group, the non-nuclear fuel minerals group or the nuclear fuel minerals group;

“high value mineral” means an unwrought precious metal and a rough and uncut emerald, ruby or sapphire, and any other mineral declared under subsection (3)(b) to be a high value mineral;

“industrial minerals group” means, subject to the provisions of subsection (4), a group of minerals specified in Part 3 of Schedule 1;

“land” includes the sea and the seabed within the territorial sea referred to in section 2 of the Territorial Sea and Exclusive Economic Zone of Namibia Act, 1990 (Act 3 of 1990), the exclusive economic zone referred to in section 4 of that Act and the continental shelf referred to in section 6 of that Act, and land beneath any other water, and the subsoil of land;

“mine” means -

- (a) when used as a noun, any place where mining operations are or have been carried on, and includes any excavation or accessory works which is or are necessary for, or incidental to, such mining operations; or
- (b) when used as a verb, means any operations calculated to win any mineral or group of minerals from a mine or from any ore won from a mine, and includes any operations which are necessary for, or incidental to, such operations, and "mining" shall have a corresponding meaning;

“mineral” means any substance, whether in solid, liquid or gaseous form, occurring naturally in, on or under any land and having been formed by, or subjected to, a geological process, excluding -

- (a) water, not being water taken from land or from the sea for the extraction therefrom of a mineral or a group of minerals;
- (b) petroleum, as defined in section 1 of the Petroleum (Exploration and Production) Act, 1991 (Act 2 of 1991); or
- (c) subject to the provisions of subsection (2), soil, sand, clay, gravel or stone (other than rock material specified in Part 2 of Schedule 1) if they are *bona fide* required for purposes of -
 - (i) agriculture, building works, fencing or road making;
 - (ii) the manufacture of bricks and tiles;
 - (iii) the construction of sports fields, airfields, railways, bridges, dams, reservoirs, weirs, canals or other irrigation works; or
 - (iv) any other purpose defined by the Minister by notice in the *Gazette*;

“mineral agreement” means an agreement entered into in terms of section 49;

“mineral deposit retention licence” means a mineral deposit retention licence issued under section 81 and includes the renewal of such licence;

“mineral licence” means a reconnaissance licence, an exclusive prospecting licence, a mining licence or a mineral deposit retention licence and includes the renewal of any such licence;

“mining area” means the area of land to which a mining licence relates;

“mining claim” means a claim registered under section 36 and includes the renewal of the registration of any such claim;

“mining licence” means a mining licence issued under section 93 and includes the renewal of any such licence;

“mining operations” means any operations carried on in connection with mining;

“Minister” means the Minister of Mines and Energy;

“non-exclusive prospecting licence” means a non-exclusive prospecting licence issued under section 21 and includes the renewal of any such licence;

“non-nuclear fuel minerals group” means, subject to the provisions of subsection (4), a group of minerals specified in Part 4 of Schedule 1;

“nuclear fuel minerals group” means, subject to the provisions of subsection (4), a group of minerals specified in Part 5 of Schedule 1;

“officer” means an officer or employee as defined in section 1 of the Public Service Act, 1980 (Act 2 of 1980);

“owner” means -

(a) the person in whose name any private land is registered in the Deeds Registry, and includes -

(i) if the owner of such land is deceased, the executor of his or her estate;

- (ii) if the estate of the owner of such land has been sequestrated, the trustee of his or her estate;
 - (iii) if the owner of such land is a company which has been wound up, the liquidator of such company;
 - (iv) if the owner of such land is under a legal disability, his or her legal representative;
 - (v) if such land has been attached in terms of an order of a court of law the sheriff or deputy sheriff; or
 - (vi) the person who has been authorized in writing by the owner to act on behalf of such owner for purposes of the provisions of this Act;
- (b) a lessee of land owned by the State,

but does not include the holder of any grazing rights in, on or in respect of any such land;

“Permanent Secretary” means the Permanent Secretary: Mines and Energy;

“precious metals group” means, subject to the provisions of subsection (4), a group of minerals containing the elements specified in Part 6 of Schedule 1;

“precious stones group” means, subject to the provisions of subsection (4), a group of minerals specified in Part 7 of Schedule 1;

“private land” means land other than State land, including land leased from the State if the lessee of such land has exercised his or her option to purchase such land;

“prospecting” means intentionally searching, whether by way of excavations or otherwise, for any mineral or group of minerals with a view to delineating or evaluating deposits or concentrations of any such mineral or group of minerals, but does not include “mining”;

“prospecting area” means the area of land to which an exclusive prospecting licence relates;

“prospecting operations” means any operations carried on in connection with prospecting, including any accessing, extraction or incidental winning of any mineral or group of minerals for the purposes of mineralogical examination, assaying, testwork or marketability surveys;

“reconnaissance area” means an area of land to which a reconnaissance licence relates;

“reconnaissance licence” means a licence issued under section 62 and includes the extension of such licence;

“reconnaissance operations” means any operations carried on in a general search for any mineral or group of minerals by means of aerial sensing techniques, including geophysical surveys, photogeological mapping or imagery carried on from the air, and

“reconnaissance” shall have a corresponding meaning;

“retention area” means an area of land to which a mineral deposit retention licence relates;

“semi-precious stones group” means, subject to the provisions of subsection (4), a group of minerals specified in Part 8 of Schedule 1;

“unwrought precious metal” means any unmanufactured metal consisting of gold, silver, platinum, palladium, osmium, rhodium, iridium and ruthenium in the form of bars, ingots, buttons, wire, plate, granules or in solution or in any other form whatsoever, or any article or substance containing such precious metal, or any article consisting of or containing such precious metal which although manufactured is not as such an article of commerce or a work of art or an article of archaeological interest;

“waste” means any waste rock, tailings, slimes or other residue derived from any prospecting operations, mining operations or processing of any mineral or group of minerals.

(2) The Minister may, if he or she is on reasonable grounds satisfied that at any place or on any land in Namibia, soil, sand, clay, gravel or stone (other than rock material specified in Part 2 of Schedule 1) is won or mined by any person for purposes of the disposal of such soil, sand, clay, gravel or stone to any other person for profit or for use in the course of any business or undertaking, by notice in the *Gazette* declare that any provision of this Act specified in such notice shall apply, subject to such conditions, limitations or exceptions, if any, as may be specified in such notice, to such soil, sand, clay, gravel or stone at such place or on such land specified in such notice as if such soil, sand, clay, gravel or stone were a mineral.

(3) The Minister may, if he or she deems it desirable in the interests of the development or the protection of the mineral resources in Namibia, at any time by notice in the *Gazette* declare -

(a) any mineral other than a diamond to be a controlled mineral;

(b) any mineral other than a diamond to be a high value mineral.

(4) If for purposes of any provision of this Act any dispute arises as to the question whether any mineral falls within any group of minerals, the Minister shall have the power to determine in which group of minerals such mineral shall fall for such purposes, and any such determination shall be final.

PART II

Rights in relation to minerals

2. Rights in relation to minerals.

Subject to any right conferred under any provision of this Act, any right in relation to the reconnaissance or prospecting for, and the mining and sale or disposal of, and the exercise of control over, any mineral or group of minerals vests, notwithstanding any right of ownership of any person in relation to any land in, on or under which any such mineral or group of minerals is found, in the State.

3. Prohibition on carrying on certain operations without licence, and transfer of certain licences or grant, cession or assignment of interests in such licences, and joinder of persons as joint holders of such licences or interests.

(1) Subject to the provisions of this Act, no person shall—

(a) carry on any reconnaissance operations, prospecting operations or mining operations in, on or under any land in Namibia, except under and in accordance with a non-exclusive prospecting licence, a mining claim or a mineral licence, as the case may be; or

(b) transfer any mining claim, exclusive prospecting licence, mineral deposit retention licence or mining licence, or grant, cede or assign any interest in any such claim or licence to any other person, or be joined as a joint holder of such mining claim, licence or interest otherwise than in writing and with the approval in writing of the Minister.

(2) Any person who contravenes or fails to comply with the provisions of subsection (1) shall be guilty of an offence and on conviction liable to a fine not exceeding R 100 000 or to imprisonment for a period not exceeding five years or to both such fine and such imprisonment.

PART III
Administration of Act

4. Appointment of Mining Commissioner, and designation of other officers.

(1) The Minister shall, subject to the laws governing the public service, appoint a person to be known as the Mining Commissioner who shall exercise or perform, subject to the direction and control of the Minister, the powers, duties and functions conferred or imposed upon the Commissioner by or under the provisions of this Act and such other functions as may be imposed upon the Commissioner by the Minister.

(2) The Commissioner shall be assisted by such other officers as may be designated by the Permanent Secretary for such purpose.

(3) The powers conferred and the duties and functions imposed upon the Commissioner by or under the provisions of this Act may be exercised or performed by the Commissioner personally or, except in so far as the Commissioner otherwise determines, by any officer referred to in subsection (2) engaged in carrying out such

provisions under the direction and control of the Commissioner.

5. General powers of Commissioner

(1) Subject to the provisions of subsection (2), the Commissioner or any officer who is engaged in carrying out the provisions of this Act and who has been authorized thereto by the Commissioner may, in order to exercise any power or perform any duty or function conferred or imposed by this Act

- (a) at all reasonable times enter any land or place where any reconnaissance operations, prospecting operations or mining operations have been, are or are to be carried on, including any accessory works or land to which any such operations or accessory works relate;
 - (b) take or remove, for purposes of mineralogical examination, assaying, testwork or marketability surveys from-
 - (i) any land, place or accessory works referred to in paragraph (a), any sample of any mineral or group of minerals; or
 - (ii) any such land, place or accessory works a sample taken of any sample, or taken of any mineral or group of minerals won or mined, in the course of any operations referred to in paragraph (a);
 - (c) seize any sample referred to in paragraph (b) or any book, record or document which may in his or her opinion be used in evidence in connection with any offence in terms of this Act;
 - (d) inspect, make extracts from, and make copies of any book, record or document in relation to any operations or accessory works referred to in paragraph (a);
 - (e) may make such investigations and inquiries as may be necessary to determine whether the provisions of this Act or any term and condition, direction or order determined, given or made under this Act is being complied with.
- (2) The Commissioner or officer referred to in subsection (1) shall -

- (a) before exercising any powers under that subsection, identify himself or herself to any holder of a non-exclusive prospecting licence, mining claim or mineral licence or the owner or occupier or other person in charge of the land, place or accessory works, any sample, mineral or group of minerals, or book, record or document in question;
- (b) issue a receipt in respect of any sample taken or removed under paragraph (b) of that subsection or any sample, book, record or document seized under paragraph (c) of that subsection;
- (c) upon any claim received from the owner of any such sample, return such sample to such owner if it is not used within a reasonable period in evidence in connection with any offence in terms of this Act, or pay to such owner an amount equal to the market value of such sample;
- (d) return such book, record or document to the owner of such book, record or document if it is not used within a reasonable period in evidence in connection with any offence in terms of this Act.

(3) The Commissioner or officer referred to in subsection (1) may, in the exercise of his or her powers under that subsection, consult with, or be accompanied by any person who in the opinion of the Commissioner or such officer, has special or expert knowledge of any matter in relation to which such powers are to be exercised.

- (4) (a) The holder of a non-exclusive prospecting licence, a mining claim or a mineral licence or the owner or occupier or other person in charge of any land, place, accessory works, mineral, group of minerals, book, record or document referred to in subsection (1) shall provide the Commissioner or officer so referred to with such reasonable facilities or assistance as may be necessary for the exercise of the powers or the performance of the duties and functions conferred or imposed upon the Commissioner or such officer in terms of that subsection.
- (b) Any person who contravenes or fails to comply with the provisions of paragraph (a) shall be guilty of an offence and on conviction liable to a fine not exceeding R8 000 or to imprisonment for

a period not exceeding 12 months or to both such fine and such imprisonment.

6. Preservation of secrecy.

(1) The Commissioner, any other officer employed in the Ministry of Mines and Energy, whether or not engaged in carrying out the provisions of this Act, and any other person engaged in carrying out any provision of this Act shall preserve and aid in preserving secrecy in relation to all matters that may come to his or her knowledge in the exercise of the powers or the performance of the duties and functions conferred or imposed upon the Commissioner or such officer or person in terms of any provision of this Act, and shall not communicate any such matter to any other person or permit any other person to have access to any documents in his or her possession or custody, except in so far as any such communication-

- (a) is required by, or may be made in terms of, this Act or any other law, or is required by an order of a competent court;
- (b) is effected with the prior permission in writing of the person concerned, or of the Minister granted in respect of any matter which in the opinion of the Minister is of a general nature and may be disclosed in the public interest;
- (c) relates to any information submitted, whether by way of a report, return or otherwise, to the Minister or the Commissioner in terms of any provision of this Act in connection with any reconnaissance operations, prospecting operations or mining operations carried on under a nonexclusive prospecting licence, mining claim or mineral licence, as the case may be, unless the holder of such licence or mining claim has applied for any other mineral licence or the registration of a mining claim in respect of the prospecting area, mining area or claim area, as the case may be, in relation to which such information has been submitted or the secrecy of such information is required to be preserved in terms of any term and condition of such mineral licence or mining claim.

(2) Any person who contravenes or fails to comply with the provisions of subsection (1) shall be guilty of an offence and on conviction liable to a fine not exceeding R8 000 or to imprisonment for a period not exceeding 12 months or to both such fine and such imprisonment.

7. Prohibition of certain officers on holding certain interests in mineral licences or in companies holding mineral licences.

(1) The Commissioner or any other officer employed in the Ministry of Mines and Energy, whether or not engaged in carrying out the provisions of this Act and any other officer engaged in carrying out the provisions of this Act, shall not-

- (a) acquire, whether directly or indirectly, any right or interest in any non-exclusive prospecting licence, mining claim or mineral licence;
- (b) acquire or hold any share, as defined in section 1 of the Companies Act, 1973 (Act 61 of 1973), or interest in a company which is the holder of a non-exclusive prospecting licence, a mining claim or a mineral licence.

(2) For the purposes of paragraph (b) of subsection (1), the acquisition or holding of a share, as defined in section 1 of the Companies Act, 1973 (Act 61 of 1973), or interest in a company by the husband or wife of the Commissioner or an officer referred to in that subsection, shall be deemed to be an acquisition or holding by the Commissioner or such officer, as the case may be.

(3) Any document or transaction purporting to grant any right or interest referred to in paragraph (a) of subsection (1) upon, or any share certificate or other document purporting to vest any shares or interest referred to in paragraph (b) of that subsection in, the Commissioner or such officer shall be null and void.

(4) Any person who contravenes or fails to comply with the provisions of subsection (1) shall be guilty of an offence and on conviction liable to a fine not exceeding R8 000 or to imprisonment for a period not exceeding 12 months or to both such fine and such imprisonment.

(5) In any prosecution for an offence referred to in paragraph (b) of subsection (1), it shall be a sufficient defence if the accused person proves that the share in question was acquired -

- (a) by operation of law and that all reasonable steps necessary have been taken, and are being taken, to dispose of the share or interest; or

- (b) before he or she became the Commissioner or an officer referred to in subsection (1) or before the company became the holder of the non-exclusive prospecting licence, mining claim or mineral licence, as the case maybe, and that as from the date on which he or she was appointed as the Commissioner or designated as such officer or as from the date on which such company became such holder, all reasonable steps necessary have been taken, and are being taken to dispose of the share.

8. Limitation of liability.

No compensation shall be payable by the State or by the Commissioner or any other officer employed in carrying out the provisions of this Act in respect of any act done in good faith under this Act.

PART IV Minerals Board of Namibia

9. Establishment of Minerals Board of Namibia.

There is hereby established a board to be known as Minerals Board of Namibia.

10. Functions of board.

(1) The functions of the board shall be to advise the Minister generally or in respect of a particular matter, and make recommendations to him or her, in relation to-

- (a) the policy which is or may be followed in relation to the reconnaissance or prospecting for, and the mining and disposal of, and the exercise of control over, any mineral or group of minerals in Namibia, and the manner in which such policy is or may be implemented;
- (b) the amendment or application of the provisions of this Act;
- (c) any matter referred to the board by the Minister under subsection (2).

(2) Where the Minister is required to exercise or perform any power, duty or function or to take any decision under or for the purposes of this Act, the Minister may, before doing so, request the board to advise him or her in relation to the exercise or performance of such power, duty or function or the taking of such decision.

11. Constitution of board.

(1) The board shall consist of -

- (a) the Minister or a person designated by him or her who shall be the chairperson of the board;
- (b) two persons nominated by the Chamber of Mines of Namibia and appointed by the Minister of whom –
 - (i) one shall represent the interests of persons involved in prospecting operations; and
 - (ii) one shall represent the interests of persons involved in mining operations;
- (c) two persons appointed by the Minister of whom
 - (i) one in the opinion of the Minister represents the interests of persons involved in small scale prospecting operations;
 - (ii) one in the opinion of the Minister represents the interests of persons involved in small scale mining operations;
- (d) one person appointed by the Minister who in the opinion of the Minister represents the interests of trade unions established in the interests of persons employed by holders of licences issued under this Act or holders of mining claims; and
- (e) two persons employed in the Ministry of Mines and Energy designated by the Minister.

(2) For purposes of the constitution of the board in terms of subsection (1) or to fill any casual vacancies which may have occurred in the membership of the board, the Minister shall by notice in writing invite the Chamber of Mines of Namibia to make the required nominations within such period as may be determined by the Minister and specified in such notice.

(3) If the Chamber of Mines of Namibia ceases to exist or fails to comply with any invitation referred to in subsection (2) within the period referred to in that subsection, the Minister may, with due regard to the provisions of subsection (1), appoint as a member of the board a person who in his or her opinion represents the

interests of the persons referred to in paragraph (b)(i) or (ii), as the case may be.

(4) The board may co-opt, with the concurrence of the Minister, on such conditions as may be determined in writing by the Minister

(a) not more than five persons of whom one each may be designated by

(i) the Minister of Finance;

(ii) the Minister of Wildlife, Conservation and Tourism;

(iii) the Minister of Fisheries and Marine Resources;

(iv) the Minister of Health and Social Services; and

(v) the Minister of Agriculture, Water and Rural Development,

or, as the circumstances may require, by any one of the said Ministers;

(b) one person designated by any such other Minister or by each one of such other Ministers as the Minister may, after consultation with such other Minister or Ministers, determine;

(c) one or more other persons,

to assist it in the exercise or performance of its functions, but such person or persons shall not be entitled to vote on any matter before the board

12. Term of office and conditions of service of members of board

(1) Subject to the provisions of section 13, a member of the board referred to in paragraph (b), (c) or (d) of subsection (1) of section 11 shall hold office for a period of three years, but may be reappointed at the expiration of that period.

(2) A member of the board who is not employed in the public service on a fulltime basis shall be paid out of money, appropriated for such purpose by an Act of Parliament, such remuneration and allowances, if any, and in respect of a journey undertaken for purposes of the

business of the board, such subsistence and travelling allowances as the Minister may, with the concurrence of the Minister of Finance, determine.

(3) The remuneration and allowances determined under subsection (2) may differ according to the office on the board held by a member of the board concerned or the functions performed by him or her.

13. Vacation of office by members of board.

(1) A member of the board shall vacate his or her office if-

- (a) the estate of such member is sequestrated, or such member compromises with his or her creditors;
- (b) such member is according to the law detained as a mentally ill person;
- (c) such member is convicted of an offence and sentenced to imprisonment without the option of a fine;
- (d) such member, by writing under his or her hand adduced and delivered to the Permanent Secretary, resigns from his or her office as a member of the board;
- (e) such member has absented himself or herself from two consecutive meetings of the board without the leave of the chairperson of the board;
- (f) such person's nomination or designation, as the case may be, as a member of the board is withdrawn by notice in writing addressed and delivered to the Minister by the person who has nominated or designated him or her.

(2) Any casual vacancy on the board caused by the death or vacation of office by any member of the board shall, with due regard to the provisions of section 11, be filled for the unexpired portion of the period of office of the member of the board who has died or vacated his or her office, as the case may be.

14. Meetings of board and decisions.

(1) Subject to the provisions of subsection (2), a meeting of the board shall be held at such time and place as may be determined by the chairperson of the board.

(2) The chairperson of the board shall, if he or she is not the Minister, at the request of the Minister or on a reasoned request in writing of at least four members of the board convene a special meeting of the board.

(3) The majority of the members of the board shall form a quorum for a meeting of the board.

(4) The chairperson of the board shall preside at all meetings of the board at which he or she is present.

(5) When the chairperson of the board is absent from a meeting of the board the members of the board present shall elect a person from among their number to act as chairperson at that meeting, and while such member so acts he or she shall have all the powers and shall perform all the duties of the chairperson.

(6) The decision of a majority of the members of the board present at the meeting of the board shall be a decision of the board: Provided that in the event of an equality of votes the person presiding at the meeting shall have a casting vote in addition to his or her deliberative vote.

(7) The person presiding at a meeting of the board shall, if such person is not the Minister, cause –

(a) any decision of the board and the reasons for such decision; and

(b) upon the request of any member who has voted against such decision, his or her reasons for voting against such decision,

to be conveyed to the Minister.

(8) No decision taken by the board or act performed under the authority of the board shall be invalid by reason only of a vacancy on the board, or by reason only of the fact that any person who is not entitled to sit as a member of the board sat as a member of the board when the decision was taken or the act was authorized, if the decision was taken or the act was authorized by the requisite majority of the members of the board who were present at the time and entitled to sit as such members.

(9) The board shall cause a record to be kept of the proceedings of the meetings of the board.

(10) The board may make rules in relation to the holding of, and procedure at, meetings of the board.

15. Performance of administrative functions of board

(1) The administrative and clerical work involved in the performance of the functions of the board shall be performed by officers in the Ministry of Mines and Energy made available by the Permanent Secretary for that purpose.

(2) The Permanent Secretary may designate an officer referred to in subsection (1) as secretary of the board

(3) Subject to the provisions of the State Finance Act, 1991 (Act 31 of 1991), the board may, after consultation with the Permanent Secretary and on such conditions as may be mutually agreed upon, obtain the services of such persons as it may deem necessary to advise it in connection with the performance of its functions.

PART V

Provisions relating to non-exclusive prospecting licences

16. Rights of holders of non-exclusive prospecting licences.

(1) Subject to the provisions of subsections (2) and (3), the holder of a nonexclusive prospecting licence shall be entitled-

- (a) to carry on prospecting operations on any land for any mineral or group of minerals;
- (b) to remove any mineral or group of minerals other than a controlled mineral or sample of such mineral or group of minerals, for any purpose other than sale or disposal, from any place where it was found or incidentally won in the course of prospecting operations referred to in paragraph (a) to any place within Namibia;
- (c) with the permission of the Commissioner previously obtained generally or in every particular case in writing and subject to such conditions as may be determined by the Commissioner or subject to the conditions of an exemption granted under section 137-

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- (i) to remove any mineral or group of minerals referred to in paragraph (b) for any purpose other than sale or disposal, from any place where it was found or incidentally won in the course of prospecting operations referred to in paragraph (a) to any place outside Namibia;
- (ii) to remove any controlled mineral or sample of such mineral, for any purpose other than sale or disposal, from any place where it was found or incidentally won in the course of prospecting operations referred to in paragraph (a) to any place, whether within or outside Namibia;
- (iii) to remove any mineral or group of minerals, for purposes of sale or disposal, from any place where it was found or incidentally won in the course of such prospecting operations;
- (iv) to sell or otherwise dispose of any such mineral or group of minerals.

(2) The holder of a non-exclusive prospecting licence shall not exercise any rights conferred upon such holder by subsection (1)-

- (a) in, on or under any private land until such time as such holder has by way of an endorsement on such licence or otherwise obtained the permission in writing of the owner of such land to exercise such rights on such land without the payment of any compensation to such owner, or has complied *mutatis mutandis* with the provisions of section 52(1)(a)(i) or has been granted an ancillary right as provided in section 110(4) to exercise such rights on such land;
- (b) unreasonably and in such manner that the rights and interests of the owner of any land to which such licence relates are adversely affected, except to the extent to which such owner is compensated;
- (c) in respect of any mineral or group of minerals, in, on or under any land forming part of -

- (i) any land in relation to which an application by any other person for a reconnaissance licence and an exclusive right referred to in section 59 in respect of such mineral or group of minerals, submitted to the Commissioner and posted on the notice board in the office of the Commissioner, is pending;
- (ii) a reconnaissance area in relation to which an application by any other person for an exclusive right referred to in section 59 in respect of such mineral or group of minerals, submitted to the Commissioner and posted on the notice board in the office of the Commissioner, is pending; or
- (iii) a reconnaissance area in relation to which an exclusive right referred to in section 59 has been conferred upon any person in respect of such mineral or group of minerals;
- (d) in, on or under any land in a claim area, a prospecting area, a retention area or a mining area or, subject to the provisions of section 29, in, on or under any claim;
- (e) in, on or under any land in respect of which an application by any other person for an exclusive prospecting licence, a mineral deposit retention licence or a mining licence, submitted to the Commissioner in accordance with the provisions of section 47 and posted on the notice board in the office of the Commissioner, is pending;
- (f) in, on or under any land in respect of any source material specified in Part 5 of Schedule 1.

(3) The provisions of sections 52(1)(b), (c), (d), (e) and (f), (2), (3), (4), (5), (6) and (7) and 53 shall apply *mutatis mutandis* in relation to the holder of a non-exclusive prospecting licence.

(4) An application for the permission referred to in subsection (1)(c), shall be made to the Commissioner in such form as may be determined in writing by the Commissioner and shall be accompanied by such application fee, if any, as may be determined under section 123, together with such documents and information as may be required by the Commissioner.

(5) The holder of a non-exclusive prospecting licence who has removed, as contemplated in paragraph (b) of subsection (1), any mineral or group of minerals other than a controlled mineral or any sample of such mineral or group of minerals from the place where it was found or incidentally won, for any purpose other than for sale or disposal, to any place within Namibia, shall, except to the extent to which such holder has been exempted under the provisions of section 137 from the provisions of this subsection, inform the Commissioner in writing of such removal, not later than 14 days or such longer period after such removal as the Commissioner may allow, and provide particulars of the nature of such sample, mineral or group of minerals and the place to which it has been so removed.

(6) (a) The holder of a non-exclusive prospecting licence who has contravened or failed to comply with the provisions of subsection (1)(c) or (5) shall be guilty of an offence and on conviction liable to a fine not exceeding R20 000 or to imprisonment for a period not exceeding two years or to both such fine and such imprisonment.

(b) If in any prosecution in terms of paragraph (a) of this subsection for the contravention or failure to comply with the provisions of subsection (1)(c)(iii), it is proved -

- (i) that the holder referred to in that paragraph has removed any mineral or group of minerals from the area to which the non-exclusive prospecting licence relates;
- (ii) that such holder has not obtained the permission of the Commissioner for the removal of such mineral or group of minerals as required by subsection (1)(c); and
- (iii) that such holder has failed to inform the Commissioner of the removal of such mineral or group of minerals as provided in subsection (5),

it shall be presumed until the contrary is proved that such holder has removed such mineral or group of minerals for purposes of sale or disposal.

17. Persons who may apply for non-exclusive prospecting licences.

Any person may apply for a non-exclusive prospecting licence, provided, in the case of a natural person, such person has reached the age of 18 years.

18. Applications for non-exclusive prospecting licences.

(1) Subject to the provisions of this Act, an application for a non-exclusive prospecting licence shall be made to the Commissioner in such form as may be determined in writing by the Commissioner and shall be accompanied by such application fee and such licence fee in respect of the licence period of such licence as may be determined under section 123.

(2) An application referred to in subsection (1)-

(a) shall contain -

(i) in the case of a natural person -

(aa) the full names, nationality, date of birth, postal and residential address of such person; and

(bb) particulars, if any, of any convictions by a court of law in respect of which he or she was sentenced to imprisonment, whether suspended or not, without the option of a fine; or

(ii) in the case of a company, the name of such company, particulars of its incorporation and registration as a company, the registered address and principal place of business of such company in Namibia and the names and nationality of the directors of the company; and

(iii) in the case of any, such person represented by an accredited agent the full names and address of such accredited agent;

(b) shall be accompanied by such documents as the Commissioner may require in relation to any particulars referred to in this section; and

(c) may contain any other matter which in the opinion of the person concerned is relevant to the application.

(3) Subject to the provisions of this Act, the Commissioner may grant on such terms and conditions as may be determined in writing by him or her, or refuse to grant, an application referred to in subsection (1).

19. Powers of Commissioner in respect of applications for nonexclusive prospecting licences.

(1) The Commissioner may at any time after receipt of any application for a non-exclusive prospecting licence referred to in section 11 require the person concerned by notice in writing to furnish him or her within such reasonable period as may be specified in such notice, with-

- (a) such information specified in such notice as the Commissioner may in his or her discretion deem necessary to enable him or her to determine who, in the case of a company, has the controlling interest in the affairs of the company; or
- (b) such other information so specified as the Commissioner may in his or her discretion deem necessary for purposes of considering such application.

(2) In order to enable the Commissioner to consider any application referred to in subsection (1) the Commissioner may cause such investigations to be made or undertaken as the Commissioner may in his or her discretion deem necessary.

20. Restrictions on grant of non-exclusive prospecting licences.

The Commissioner shall not grant an application for a nonexclusive prospecting licence to any natural person, unless such person is a person referred to in section 17 and is in the opinion of the Commissioner a fit and proper person to hold such licence.

21. Issue of non-exclusive prospecting licences.

(1) The Commissioner shall, upon the granting of an application for a nonexclusive prospecting licence, issue to the person who applied for such licence a nonexclusive prospecting licence in such form and on such terms and conditions as may be determined by the Commissioner.

(2) Subject to the provisions of subsection (1), a nonexclusive prospecting licence shall –

- (a) contain the full names and address of the holder of the non-exclusive prospecting licence and, in

the case of such a holder who is resident outside Namibia, the full names and address of such holder's accredited agent

- (b) state the date on which and the period for which such non-exclusive prospecting licence is issued;
- (c) state, whether or not by way of an annexure to such licence, the terms and conditions subject to which such licence is issued;
- (d) contain a reference to the place where the issue of such licence has been recorded in the register kept in terms of section 51, as applied by subsection (3) of this section; and
- (e) contain such other particulars as the Commissioner may, either generally or in any particular case, determine.

(3) The provisions of section 51 shall apply in relation to every non-exclusive prospecting licence issued in terms of this section.

22. Duration of non-exclusive prospecting licence.

Subject to the provisions of this Act, a nonexclusive prospecting licence shall be valid for a period of 12 months.

23. Transfer or renewal of nonexclusive prospecting licences, and grant, cession or assignment of interests in such licences, and joinder of persons as joint holders of such licences or interests.

A non-exclusive prospecting licence shall not be transferred or renewed, and the holder of any non-exclusive prospecting licence shall not grant, cede or assign any interest in such licence to any other person, and no person shall be joined as the joint holder of such licence or interest.

24. Records to be kept and returns to be submitted by holders of nonexclusive prospecting licences.

- (1) The holder of a non-exclusive prospecting licence -
 - (a) shall keep at an address in Namibia a proper record in such form as may be determined in writing by the Commissioner in relation to-
 - (i) the nature and mass or volume of any mineral or group of minerals found or incidentally won in the course of such prospecting operations; and

- (ii) the nature, mass or volume and value of any mineral or group of minerals sold or otherwise disposed of and the full names and address of any person to whom such mineral or group of minerals has been sold or otherwise disposed of,

and shall retain such records for a period of not less than three years as from the expiry of such licence;

- (b) shall submit in respect of the period of such licence's currency to the Commissioner in such form as the Commissioner may determine a statement of income and expenditure derived or incurred in relation to the information contemplated in paragraph (a);
- (c) shall upon the request of the Commissioner produce the record referred to in paragraph (a) or any copies of such records to the Commissioner for inspection.

(2) Any person referred to in subsection (1) who contravenes or fails to comply with the provisions of that subsection shall be guilty of an offence and on conviction be liable to a fine not exceeding R8 000 or to imprisonment for a period not exceeding 12 months or to both such fine and such imprisonment.

PART VI

Pegging of claims

25. Persons who may peg claims.

(1) No person shall peg any claim, unless such person is the holder of a non-exclusive prospecting licence or, with the permission of the Minister referred to in subsection (2), an exclusive prospecting licence, and such person-

- (a) is a Namibian citizen; or
- (b) is, in the case of a company referred to in paragraph (a) of the definition of "company" in section 1, a company whose articles of association contain a provision providing -

- (i) that only Namibian citizens may own shares in such company;
 - (ii) that only another company whose articles of association contain such a provision may own shares in such firstmentioned company; or
 - (iii) that only Namibian citizens and a company referred to in subparagraph (ii) may own shares in such firstmentioned company; or
- (c) is a company referred to in paragraph (b) of the definition of "company" in section 1.
- (2) (a) The Minister may, upon an application made by the holder of an exclusive prospecting licence contemplated in subsection (1) and if the Minister deems it desirable in the interests of the development of the mineral resources of Namibia, grant such holder permission to peg a claim.
- (b) An application referred to in paragraph (a) shall be made to the Minister in such form as may be determined in writing by the Minister and shall be accompanied by such application fee, if any, as may be determined under section 123, together with such documents as may be required by the Minister.
- (3) Notwithstanding the provisions of subsection (1), the Minister may, upon an application made to him or her in such form as may be determined in writing by the Minister and if the Minister deems it desirable in the interests of the development of the mineral resources of Namibia, declare by notice in the *Gazette* that any company other than a company referred to in paragraph (b) or (c) of subsection (1) shall, for purposes of this section, be deemed, either generally or in respect of any particular claim, to be a company referred to in the said paragraph (b).

26. Restrictions on pegging of claims.

- (1) No person shall peg any claim in respect of source material specified in part 5 of Schedule 1.
- (2) Subject to the provisions of subsection (3), no person shall peg-

- (a) any claim if such person is the holder of 10 or more mining claims;
- (b) more than 10 claims; or
- (c) such number of claims which would, together with any other claims pegged by him or her or any mining claims of which he or she is the holder, amount to more than 10 claims,

without the prior permission in writing of the Minister.

(3) An application for the permission of the Minister referred to in subsection (2) shall be made to the Minister in such form as may be determined in writing by the Minister and shall be accompanied by such application fee, if any, as may be determined under section 123, together with such documents as may be required by the Minister.

(4) The Minister shall in considering an application referred to in subsection (3) have regard to the interests of the development of the mineral resources of Namibia and the technical and financial resources of, or available to, such person to carry on mining operations or prospecting operations on the claim to which such application relates.

27. Limitations on pegging of claims.

(1) No claim shall, be pegged by a person referred to in section 25-

- (a) between sunset and sunrise or on a Sunday or on any public holiday specified in the Schedule to the Public Holidays Act, 1990 (Act 26 of 1990); and
- (b) unless such person or any other person authorized thereto by him or her in writing, is present and in possession of such licence or a copy of such first-mentioned person's non-exclusive prospecting licence or the exclusive prospecting licence the case may be, certified as a true copy by a commissioner of oaths, on the land on which such claim is pegged.

(2) The person referred to in subsection (1) shall allot to each claim pegged by him or her in accordance with the provisions of this section an ordinal number in consecutive order commencing from the number one.

(3) Any person who contravenes or fails to comply with the provisions of subsection (1) shall be guilty of an offence and on conviction liable to a fine not exceeding R8 000 or to imprisonment for a period not exceeding 12 months or to both such fine and such imprisonment.

28. Manner of pegging of claims.

(1) Subject to the provisions of subsection (2), a claim -

(a) shall be of rectangular shape of which the dimensions of its longer and shorter sides shall measure horizontally 600 and 300 metres, respectively;

(b) shall not include portions of land which are not contiguous to each other.

(2) The provisions of subsection (1) shall not apply in relation to a claim in respect of which the proximity of existing claims or mining claims or existing mining areas, prospecting areas or retention areas or the application of the provisions of section 6(2) renders such shape and dimensions impossible: Provided that the area of such claim shall not exceed 18 hectares.

(3) Subject to the provisions of subsection (5), a claim referred to in subsection (1) shall be pegged by erecting—

(a) two middle beacons 300 metres horizontally apart, each at the middle point of the long sides of such claim;

(b) four corner beacons, each on one of the four corners of such claim; and

(c) such line beacons between any of the beacons referred to in paragraphs (a) and (b) as may be necessary to ensure that the two beacons adjoining any beacon on the boundary of such claim are clearly visible from such last-mentioned beacon.

(4) Subject to the provisions of subsection (5), a claim referred to in subsection (2) shall be pegged by erecting—

(a) a corner beacon at each point where each line on the boundary of such claim changes direction on a horizontal level; and

- (b) such line beacons between any of the beacons referred to in paragraph (a) as may be necessary to ensure that the two beacons adjoining any beacon on the boundary of such claim are clearly visible from such last-mentioned beacon.

(5) If the place at any point where a beacon is in terms of the provisions of this section required to be erected is not reasonably accessible, one indicatory beacon shall be erected on each one of the boundary lines which meet at such point as near as possible to such point indicating the position of such point.

- (6) Every beacon contemplated in this section shall consist of -

- (a) a peg, consisting of -

- (i) a metal rod in diameter of not less than 20 millimetres or a metal fencing pole of any diameter; or
- (ii) a wooden pole in diameter of not less than 50 millimetres,

fixed, having regard to the nature of the surface of the land, firmly in an upright position projecting at least one metre above the surface of the ground;

- (b) a beacon plate at the uppermost end of the peg referred to in paragraph (a), consisting of a rectangular metal or strong wooden plate, the long and short sides of which shall measure not less than 300 millimetres and 230 millimetres, respectively;
- (c) a cairn of stones of conical shape having a diameter at its base of not less than one metre and its apex rising to at least 300 millimetres in height up the peg from the surface of the ground or, in an area where sufficient stones are not available, a heap of sand or gravel of such shape having a diameter at its base of not less than two metres and its apex rising to at least 300 millimetres in height up the peg from the surface of the ground;

- (d) where the nature of the surface of land permits, a trench of 300 millimetres deep and 300 millimetres wide surrounding the base of the cairn of stones or heap of sand or gravel referred to in paragraph (c); and
- (c) a trench of 300 millimetres deep and 300 millimetres wide or, where the nature of the surface of the land does not permit the digging of any such trench, a line of stones, extending outward from the base of the cairn of stones or heap of sand or gravel referred to in paragraph (c) for a distance of not less than two metres in the direction of the two beacons adjoining such beacon on the boundary of such claim.
- (7) Each beacon plate referred to in subsection (6) shall display in legible block letters of at least 25 millimeters in height -
- (a) the name of the holder of the licence in question;
- (b) the nature and number of the licence in question;
- (c) the ordinal number allotted by such holder to such claim in terms of section 27(2);
- (d) the date on which such claim was pegged in accordance with the provisions of subsection (3) or (4), as the case may be;
- (e) a description of the type of beacon as being a middle beacon, a corner beacon, a line beacon or an indicative beacon, as the case may be; and
- (f) in the case of an indicative beacon, the distance expressed in metres from the peg of such beacon to the point to which such indicative beacon relates.
- (8) If a claim adjoining any existing claim is pegged and any beacon of such existing claim is situated on a point where a beacon for the first-mentioned claim is, in terms of the provisions of this section, required to be erected, the holder of the licence in question pegging such claim may, in erecting a beacon at such point, make use, without causing any damage to such first-mentioned beacon, of any part of such beacon other than the peg or beacon plate thereof.

29. Effect of pegging of claims.

Subject to the provisions of this Act, no person other than the holder of the licence in question who has pegged a claim as provided in section 28(3) or (4) shall carry on any prospecting operations, and no person shall peg any claim or carry on any mining operations on any such firstmentioned claim -

- (a) during a period of 21 days as from the date on which such claim was so pegged; or
- (b) if application has been made to the Commissioner for the registration of such claim in terms of section 33, during a period as from the date on which such application has been so made until such application is refused or the application is withdrawn or has lapsed, whichever occurs first, or, if such application is granted, until such time as the registration of such claim is entered in the register referred to in section 36(2).

30. Powers of Commissioner in event of failure by holders to comply with provisions of this Part or disputes.

(1) If the Commissioner has at any time, whether before or after the registration of a claim, reason to believe that the holder of the licence in question who has pegged a claim, has contravened or failed to comply with any provision of this Part, or if any dispute arises between any such holder and any other person who has a direct and substantial interest in any matter relating to such pegging whether such holder has contravened or has failed to comply with any such provision, the Commissioner shall make such investigations in such manner and in accordance with such procedure as he or she may deem necessary or expedient.

(2) If after any investigation referred to in subsection (1), the Commissioner finds that the holder referred to in that subsection has contravened or failed to comply with any provision of this Part, the Commissioner—

- (a) may by notice in writing addressed and delivered to such holder inform such holder of his or her findings and the reasons for such finding and
 - (i) direct such holder to take, within the period specified in such notice such steps as the Commissioner may determine and specified in such notice, to give effect to the provisions of this Act; or

(ii) declare the pegging of such claim to be null and void, whereupon such claim shall, for purposes of the provisions of this Act, be deemed to have been abandoned; and

(b) may direct such holder or the other person referred to in subsection (1) to pay

(i) for the benefit of the State Revenue Fund the costs or any part of such costs incurred by the Commissioner in connection with such investigation;

(ii) to the holder or such person, as the case may be, the costs or any part of such costs incurred by such holder or person in connection with any dispute between them which gave rise to such investigation.

(3) A direction referred to in paragraph (b) of subsection (2) shall be executable as if such direction were a judgement of a magistrate's court.

(4) Any person who contravenes or fails to comply with a direction referred to in subsection (2) shall be guilty of an offence and on conviction liable to a fine not exceeding R8 000 or to imprisonment for a period not exceeding 12 months or to both such fine and imprisonment.

(5) If the holder referred to in subsection (1) fails to take to the satisfaction of the Commissioner the steps specified in the notice referred to in paragraph (a) of subsection (2) within the period specified in such notice or such further period as the Commissioner may on good cause shown allow, the Commissioner may cause such steps to be taken and recover in a competent court the costs incurred thereby from such holder.

PART VII
Provisions relating to mining claims

31. Rights of holders of mining claims.

(1) Subject to the provisions of this Act and the terms and conditions subject to which any mining claim has been registered, the holder of a mining claim shall be entitled

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- (a) to carry on mining operations on such mining claim for any mineral or group of minerals in respect of which such mining claim has been registered;
- (b) to carry on on such mining claim—
 - (i) in lieu of any mining operations referred to in paragraph (a), any prospecting operations in relation to any mineral or group of minerals for a period not exceeding six months as from the date on which such mining claim is registered or, upon the expiry of such period, such further period as the Commissioner may, on application to the Commissioner by the holder of such mining claim in such form as may be determined in writing by the Commissioner and on good cause shown, approve in writing;
 - (ii) in conjunction with any mining operations referred to in paragraph (a), any prospecting operations in relation to any mineral or group of minerals;
- (c) to remove any mineral or group of minerals other than a controlled mineral or sample of such mineral or group of minerals, for any purpose other than sale or disposal, from any place where it was won or mined in the course of mining operations referred to in paragraph (a) or found or incidentally won in the course of prospecting operations referred to in paragraph (b) to any other place within Namibia;
- (d) with the permission in writing of the Commissioner previously obtained generally or in every particular case and subject to such terms and conditions as may be determined by the

Commissioner or subject to the conditions of an exemption granted under section 137 -

- (i) to remove any mineral or group of minerals referred to in paragraph (c) for any purpose other than sale or disposal, from any place where it was won or mined in the course of mining operations referred to in paragraph (a) or found or incidentally won in the course of prospecting operations referred to in paragraph (b) to any place outside Namibia;
- (ii) to remove from the claim area, for any purpose other than sale or disposal, any controlled mineral or sample of such mineral won or mined in the course of mining operations referred to in paragraph (a) or found or incidentally won in the course of prospecting operations referred to in paragraph (c) to any other place, whether within or outside Namibia;
- (iii) to remove from the claim area, for purposes of sale or disposal, any mineral or group of minerals, won or mined in the course of mining operations referred to in paragraph (a) or found or incidentally won in the course of prospecting operations referred to in paragraph (b)(i);
- (iv) to sell or otherwise dispose of any such mineral or group of minerals;
- (e) to carry on such other operations, including the erection or construction of accessory works as may be reasonably necessary for, or in connection with, any mining operations, prospecting operations, removal, selling or disposal contemplated in paragraph (a), (b), (c) or (d).

(2) The provisions of sections 52(1)(a), (b), (c), (d), (e) and (f), (2), (3), (4), (5), (6) and (7) and 53 shall apply *mutatis mutandis* in relation to the exercise by the holder of a mining claim of the right to carry on mining operations or prospecting operations referred to in this section.

- (3) (a) The holder of a mining claim shall not erect or construct any accessory works referred to in subsection (1)(c) without the prior permission in writing of the Commissioner.
- (b) The Commissioner shall not grant the permission referred to in paragraph (a) in respect of a mining claim situated on private land, unless the holder of the mining claim -
- (i) has entered into an agreement in writing with the owner of such land containing terms and conditions relating to the payment of compensation and has submitted a copy of such agreement to the Commissioner; or
 - (ii) has been granted an ancillary right as provided in section 110(4) to exercise such rights on such land.
- (4) An application -
- (a) to carry on prospecting operations in accordance with the provisions of subsection (1)(b)(i) for a period longer than six months;
 - (b) for the permission referred to in subsection (1)(d) or (3), shall be made to the Commissioner in such form as may be determined in writing by the Commissioner and shall be accompanied by such application fee, if any, as may be determined under section 123, together with such documents and information as may be required by the Commissioner.
- (5) The holder of a mining claim who has removed, as contemplated in paragraph (c) of subsection (1), any mineral or group of minerals other than a controlled mineral or any sample of such mineral or group of minerals from the place where it was found or won, for any purpose other than for sale or disposal, to any other place within Namibia, shall, except to the extent to which such holder has been exempted under the provisions of section 137 from the provisions of this subsection, inform the Commissioner in writing of such removal, not later than 14 days or such longer period after such removal as the Commissioner may allow, and provide particulars of the

nature of such sample, mineral or group of minerals and the place to which it has been so removed.

- (6) (a) The holder of a mining claim who has contravened or failed to comply with the provisions of subsection (1)(b)(i) or (d), (3) or (5) shall be guilty of an offence and on conviction liable to a fine not exceeding R20 000 or to imprisonment for a period not exceeding two years or to both such fine and such imprisonment.
- (b) If in any prosecution in terms of paragraph (a) of this subsection for an offence referred to in subsection (1)(d)(iii), it is proved -
- (i) that the holder referred to in that paragraph has removed any mineral or group of minerals from the claim area to which the mining claim relates;
 - (ii) that such holder has not obtained the permission of the Commissioner for the removal of such mineral or group of minerals as required by subsection (1)(d); and
 - (iii) that such holder has failed to inform the Commissioner of the removal of such mineral or group of minerals as provided in subsection (5),

it shall be presumed until the contrary is proved that such holder has removed such mineral or group of minerals for purposes of sale or disposal, as the case may be.

32. Persons who may apply for registration of claims.

A person who has pegged a claim in accordance with the provisions of Part VI may apply for the registration of such claim.

33. Applications for registration of claims.

(1) Subject to the provisions of this section, an application for the registration of a claim shall be made to the Commissioner in such form as may be determined in writing by the Commissioner within 21 days as from the date on which such claim has been pegged as provided in section 28, and shall be accompanied by such application fee and such claim fee in respect of the first registration period of such mining claim as may be determined under section 123.

- (2) An application referred to in subsection (1)-
- (a) shall contain -
- (i) in the case of a natural person-
- (aa) the full names, nationality, date of birth, postal and residential address of such person; and
- (bb) particulars, if any, of any convictions by a court of law in respect of which he or she was sentenced to imprisonment, whether suspended or not, without the option of a fine; or
- (ii) in the case of a company, the name of such company and particulars of its incorporation and registration as a company, the registered address and principal place of business of the company in Namibia, the full names and nationality of the directors of the company, the share capital of the company and the full names and nationality of any person who is the beneficial owner of more than five per cent of the shares issued by such company; and
- (iii) in the case of any person represented by an accredited agent, the full names and address of such accredited agent;
- (b) shall contain particulars of -
- (i) any licences issued in terms of this Act or any law repealed by this Act held by such person alone or jointly with any other person; and
- (ii) any prospecting operations and mining operations carried on by such person alone or jointly with any other person outside Namibia, on the date of such application and during a period of 10 years immediately preceding such date; and
- (c) shall contain -

- (i) particulars of the mineral or group of minerals which such holder intends to mine on such claim;
 - (ii) the date on which such claim was pegged in accordance with the provisions of section 28(3) or (4), as the case may be;
 - (iii) the ordinal number allotted by such holder to such claim in terms of section 27(2);
 - (iv) the number and, if any, the name of the property on, and the magisterial district in, which the claim has been pegged, and the name and post address of the owner of such property;
 - (v) particulars, substantiated by documentary proof or such other proof as may be required by the Commissioner, of the technical and financial resources of, or available to, such person to carry on mining operations or prospecting operations on the claim to which the application relates; and
 - (vi) particulars of -
 - (aa) the condition of, and any existing damage to, the environment in the area to which the application relates; and
 - (bb) an estimate of the effect which the proposed prospecting operations and mining operations may have on the environment and the proposed steps to be taken in order to minimize or prevent any such effect;
- (d) shall contain, in the case of an application for the renewal of the registration of a mining claim, particulars of -
- (i) mining operations carried on on the mining claim in question and the amount expended in respect of such mining claim during the period as from the date on which it was registered or, if such registration was previously

renewed, the date on which it was so renewed, to a date not later than 14 days prior to such application; and

- (ii) any mineral or a group of minerals mined on such mining claim and sold or otherwise disposed of during such period as the Commissioner may require;
- (e) shall be accompanied by a sketch-plan in quadruplicate, together with such certificate as the Commissioner may require verifying the accuracy of such sketch-plan and confirming that the beacons of such claim have been erected in accordance with the provisions of Part VI-
- (i) drawn as near as possible to scale in ink on strong or durable paper;
 - (ii) showing the direction of either the true or magnetic northpointing towards the top edge of such paper;
 - (iii) showing the relative position of every middle beacon, corner beacon, line beacon or indicatory beacon erected on the boundaries of such claim, and the length of each boundary line of such claim
 - (iv) showing the position of all adjoining claims, mining claims or mining areas, exclusive prospecting areas or retention areas which are marked by beacons, the names of holders of such licences and the ordinal numbers appearing on such beacons;
 - (v) showing the position of such claim relative to -
 - (aa) the boundaries of, and any buildings on, the property on which such claim is pegged and the approximate angle of direction to, and distance from, at least one of the corner beacons of the claim to the nearest corner beacon or peg of such property;

- (bb) any building, water supply, road, railway, river-bed, fence, trigonometrical beacon, claim, mining claim, mining area, exclusive prospecting area or retention area which is marked with beacons within such claim or within 500 metres of any boundary of such claim; and
- (vi) showing any other particulars so as to enable the claim to be located on the land where it is situated and to be plotted on a topographical map;
- (f) shall be accompanied by such other documents as the Commissioner may require in relation to any particulars referred to in this section; and
- (g) may contain any other matter which in the opinion of the person concerned is relevant to the application.

(3) Subject to the provisions of this Act, the Commissioner may grant on such terms and conditions as may be determined in writing by him or her, or refuse to grant, an application referred to in subsection (1).

34. Powers of Commissioner in respect of applications for registration of claims.

(1) The Commissioner may at any time after the receipt of any application referred to in section 33 for the registration of a claim, require the person concerned by notice in writing to furnish him or her within such reasonable period as may be specified in such notice with -

- (a) such information specified in such notice as the Commissioner may in his or her discretion deem necessary to enable him or her to determine who, in the case of a company, are the shareholders of such company; and
- (b) such other information so specified as the Commissioner may in his or her discretion deem necessary for purposes of considering such application.

(2) In order to enable the Commissioner to consider any application referred to in subsection (1) the Commissioner may cause such investigations to be made or

undertaken as the Commissioner may in his or her discretion deem necessary, and may, in consequence of any such investigations, give such directions in writing to the person referred to in subsection (1) in relation to such application as the Commissioner may deem reasonably necessary or expedient.

(3) In considering any application referred to in subsection (1) and the terms and conditions subject to which such application may be granted, the Commissioner shall take into account the need to conserve and protect the natural resources in, on or under the land to which the application relates and in, on or under adjoining or neighbouring land.

35. Restrictions on grant of applications for registration of claims.

The Commissioner shall not grant an application for the registration by any person of a claim -

- (a) unless such person is a person referred to in section 32;
- (b) unless such person has complied with the provisions of Part VI;
- (c) if, at the time of the application, such person is contravening any provision of this Act or any term and condition, direction or order determined, given or made under any provision of this Act or is failing to comply with any such provision, term and condition, direction or order;
- (d) unless such claim is situated in an area of land in which, and relates to any mineral or group of minerals in respect of which, such person was entitled, at the time of the pegging of such claim, to carry on prospecting operations;
- (e) unless the Commissioner is on reasonable grounds satisfied—
 - (i) that such claim contains a mineral or a group of minerals to which the application relates which in the Commissioner's opinion may be mined and sold or otherwise disposed of on a profitable basis;

- (ii) that such person intends to carry on mining operations in good faith and has the technical and financial resources to do so; and
- (iii) that in the course of any such mining operations or any prospecting operations which may be carried on in lieu of such mining operations appropriate measures will be taken to minimize or prevent any pollution of the environment.

36. Registration of claims.

(1) The Commissioner shall, upon the granting of an application for registration of a claim -

- (a) register such claim, subject to such terms and conditions as may be determined in writing by the Commissioner.
- (b) enter such registration in the register of mining claims kept in terms of subsection (2);
- (c) issue, in such form as may be determined in writing by the Commissioner, a registration certificate to the person concerned which shall-
 - (i) state the full names and address of the holder of the mining claim and, in the case of such a holder who is resident outside Namibia, the full names and address of such holder's accredited agent
 - (ii) state the date on which and the period for which such mining claim is registered;
 - (iii) contain a copy of the sketch-plan referred to in section 33(2)(e) or a diagram, prepared by an officer employed in the Ministry of Mines and Energy and designated by the Permanent Secretary for that purpose, of the claim area in question containing geometrical or numerical depictions or any combination of such depiction and a description in words or symbols of such mining claim;
 - (iv) state the mineral or group of minerals in respect of which such mining claim is registered;

- (v) state, whether or not by way of an annexure to such registration certificate, the terms and conditions subject to which such mining claim has been registered; and
 - (vi) contain such other particulars as the Commissioner may, either generally or in any particular case, determine; and
 - (d) forthwith inform the owner of the land on which the claim is situated by notice in writing of the registration of such claim and furnish such owner of such particulars of the holder and the location of such claim as the Commissioner may deem appropriate.
- (2) The Commissioner shall keep and maintain a register of mining claims in which shall be recorded -
- (a) the full names and such other particulars of the holder and joint holder of a mining claim or interest in such mining claim in whose name such mining claim or interest has been registered or to whom such claim has been transferred or to whom an interest in such mining claim has been granted, ceded or assigned as may be determined in writing by the Commissioner and, in the case of a holder or joint holder of a mining claim who is resident outside Namibia, the full names and address of his or her accredited agent
 - (b) the date on which such mining claim has been registered or transferred or any interest in such mining claim has been granted, ceded or assigned or a person has been joined as joint holder of such mining claim or interest and the date on which such mining claim will lapse in terms of section 37;
 - (c) the date on which the registration of such claim has been renewed in terms of section 38 and the date on which such registration will lapse after such renewal;

- (d) a description of the location of such mining claim, including, if furnished or otherwise acquired in terms of section 40(3)(a) or 41(3), the longitude and latitude co-ordinates of any beacons of such claim;
- (e) the minerals or group of minerals in respect of which such mining claim has been registered;
- (f) particulars of any permissions granted under any provision of this Act in relation to such mining claim;
- (g) the date on which the registration of such mining claim has been cancelled in terms of section 44;
- (h) particulars of any agreement or ancillary right referred to in section 52, as applied by section 3 121 and
- (i) such other particulars as may in the opinion of the Commissioner be necessary for purposes of carrying out the provisions of this Act to effect an efficient system of registration of mining claims and any interests in such mining claims.

(3) A copy of the registration certificate issued in terms of paragraph (c) of subsection (1) and the register referred to in subsection (2) shall during ordinary office hours be open for inspection by any person free of charge, and any person may on payment of such fee as may be determined under section 123 obtain copies of such registration certificate or extracts from such register.

37. Duration of mining claims.

(1) Subject to the provisions of this Act, the registration of a mining claim shall lapse -

- (a) on a date three years as from the date on which such mining claim has been registered;
- (b) on such later date or dates not exceeding two years at a time as from the date on which such registration has from time to time been renewed in terms of section 38; or
- (c) on the date on which a mineral deposit retention licence or a mining licence is issued to the holder of such mining claim in respect of the claim area.

(2) Notwithstanding the provisions of subsection (1), but subject to the other provisions of this Act, where an application is made by the holder of a mining claim for

- (a) the renewal of the registration of such mining claim; or
- (b) a mineral deposit retention licence or a mining licence in relation to the claim area of such mining claim,

the registration of such mining claim shall not lapse until such application is refused or the application is withdrawn or has lapsed, whichever occurs first or, if such application is granted, until such time as a registration certificate is issued in respect of such renewal or, as the case may be, a mineral deposit retention licence or mining licence is issued in consequence of such application.

38. Applications for renewal of registration of mining claims.

(1) Subject to the provisions of subsection (2) of this section, the provisions of sections 33, 34, 35 and 36 shall apply *mutatis mutandis* in relation to an application for the renewal of the registration of a mining claim.

(2) An application for the renewal of the registration of a mining claim shall be made not later than 90 days before the date on which the registration of such mining claim will lapse if it is not renewed or such later date, but not later than the date on which such registration will lapse, as the Commissioner may on good cause shown allow.

39. Transfer of mining claims, and grant, cession or assignment of interests in mining claims, and joinder of persons as joint holders of such mining claims and interests.

(1) An application for the approval of the Minister for the transfer of a mining claim to any other person or for the grant, cession or assignment of an interest in any mining claim, or to be joined as a joint holder of a mining claim or such interest, shall be made to the Commissioner in such form as may be determined in writing by him or her and shall be accompanied by-

- (a) an agreement in writing entered into between the holder of the mining claim and the person to whom such mining claim is to be transferred or, to whom any interest in such mining claim is to be granted, ceded or assigned or the person to be joined as a joint holder of such mining claim or interest in which it is agreed to the satisfaction of the Minister that such transfer, grant, cession or

assignment is, subject to the approval of the Minister, final;

(b) the registration certificate issued to the holder of such mining claim and a sketch-plan, in quadruplicate, of such mining claim bearing its ordinal number; and

(c) such application In if any, as may be determined under section 123.

(2) Subject to the provisions of this Act, the Minister may grant on such terms and conditions as may be determined in writing by him or her, or refuse to grant an application referred to in subsection (1).

(3) The Minister shall not grant an application referred to in subsection (1)-

(a) if, at the time of the application, the holder of the mining claim is contravening any provision of this Act or any term and condition, direction or order determined, given or made under any provision of this Act or is failing to comply with any such provision, term and condition, direction or order;

(b) unless the person to whom the mining claim is to be transferred or an interest in such mining claim is to be granted, ceded or assigned or the person to be joined as a joint holder of such mining claim or interest is a person contemplated in paragraph (a), (b), (c) or (d) of subsection (1) of section 25.

(4) The Commissioner shall, upon the granting of an application referred to in subsection (1) -

(a) register the transfer of the mining claim or the grant, cession or assignment of an interest in a mining claim or joinder of a person as joint holder of such mining claim or such interest *mutatis mutandis* in accordance with the provisions of section 31 and shall thereupon issue *mutatis mutandis* in accordance with the provisions of section 36(1)(c) a new or other appropriate registration certificate in which such transfer, grant, cession, assignment or joinder is reflected; and

(a) notify *mutatis mutandis* in accordance with the provisions of section 36(1)(d) the owner of the

land on which such mining claim is situated of the transfer of such mining claim or the grant, cession or assignment of an interest in such claim or the joinder of a joint holder of such mining claim or interest.

(5) The person to whom a mining claim has, in terms of the provisions of this section, been transferred shall, within 30 days as from the date on which a registration certificate has been issued to him or her, with due regard to the provisions of Part VI, substitute on every claim beacon of such mining claim his or her own peg for the peg of the person from whom such mining claim was transferred bearing, in addition to the particulars referred to in section 28(7), words indicating from whom and the date on which such claim was transferred.

(6) The transfer of a mining claim or the grant, cession or assignment of any interest in a mining claim or the joinder of a person as joint holder of such mining claim or interest shall not affect any legal proceedings instituted against the holder of such claim, and such legal proceedings shall be continued as if such transfer, grant, cession, assignment or joinder had not taken place.

(7) Where -

(a.) any mining claim is transferred in accordance with the provisions of this Act;

(b) any interest in any mining claim is so granted, ceded or assigned; or

(b) any person is so joined as joint holder of such mining claim or interest,

all the rights, liabilities and obligations which vested in the holder of such mining claim on the date immediately before such transfer, grant, cession, assignment or joinder shall vest, as from the date of such transfer, grant, cession, assignment or joinder, in the person to whom such mining claim was so transferred or such interest was so granted, ceded or assigned or who was so joined, in so far as such mining claim was so transferred or such interest was so granted, ceded or assigned or such person was so joined.

(8) The provisions of subsection (7) shall not be construed as-

- (a) limiting the right of, or preventing, any person to whom private land on which a mining claim is situated is transferred from, requiring from the holder of any such mining claim to enter into a new agreement contemplated in section 52(1)(a)(i); or
 - (b) in the absence of any such agreement, limiting the right of, or preventing, such holder to obtain an ancillary right as provided in section 110(4).
- (9) Any holder of a mining claim who contravenes or fails to comply with the provisions of subsection (5) shall be guilty of an offence and liable upon conviction to a fine not exceeding R 1 000 or to imprisonment for a period not exceeding six months.

40. Directions to holders of mining claims.

(1) The provisions of section 57 shall apply *mutatis mutandis* in relation to a mining claim.

(2) in the application of the provisions of section 57 –

- (a) any reference to the Minister, shall be construed as a reference to the Commissioner;
- (b) any reference to the holder of a mineral licence, shall be construed as a reference to a holder of a mining claim; and
- (c) any reference to reconnaissance operations shall be deemed to have been deleted.

(3) (a) The Commissioner may at any time-

- (i) by notice in writing addressed and delivered to the holder of a mining claim require such holder to furnish the Commissioner within such period as may be determined by him or her in such notice of the longitude and latitude co-ordinates of each corner beacon of such claim; or
- (ii) cause the beacons of any mining claim to be surveyed and the longitude and latitude co-ordinates of such beacons to be determined,

and may enter such co-ordinates into the register referred to in section 36(2).

- (b) Any holder of a mining claim referred to in paragraph (a) who fails to comply with a notice referred to in that paragraph shall be guilty of an offence and a conviction be liable to a fine not exceeding R8 000 or to imprisonment for a period not exceeding 12 months or to both such fine and such imprisonment.

41. General terms and conditions of registration of mining claims.

(1) It shall be a term and condition of the registration of a mining claim that the holder of such mining claim shall -

- (a) exercise any right granted to him or her in terms of the provisions of this Act reasonably and in such manner that the rights and interests of the owner of any land to which such mining claim relates are not adversely affected, except to the extent to which such owner is compensated;
- (b) carry on, in accordance with the provisions of section 31, mining operations or prospecting operations in the claim area in accordance with good mining practices or good prospecting practices;
- (c) maintain all beacons erected on such mining claim in such a condition that they at all times comply with the provisions of section 28(6) and (7);
- (d) at the request of -
- (i) the Commissioner;
 - (ii) the owner of the land on which such mining claim is situated;
 - (iii) the holder of a licence who desires to peg in terms of Part VI a claim adjoining such mining claim; or
 - (iv) the holder of an exclusive prospecting licence, a mineral deposit retention licence or a mining licence in respect of a prospecting area, a retention area or mining area, as the case may be, adjoining such mining claim,

- point out all beacons erected on such mining claim upon payment of any expenses to be incurred by the holder of such mining claim or, if such beacons as shown on the sketch plan referred to in section 33(2)(e) cannot readily be located on the land, free of charge;
- (c) take all reasonable steps necessary to secure, in accordance with any applicable law, the safety, welfare and health of persons employed in such claim area, and to prevent or minimize any pollution of the environment;
 - (f) maintain, in accordance with any applicable law, in good condition and repair all accessory works in such claim area;
 - (g) remove from such claim area all structures, equipment and other goods not used or intended to be used in connection with mining operations and prospecting operations;
 - (h) take, in accordance with any applicable law, reasonable steps to warn persons who may from time to time be in the vicinity of any accessory works of the possible hazards resulting therefrom;
 - (i) give to the Commissioner notice of -
 - (i) the discovery of any mineral or group of minerals other than a mineral or group of minerals to which such mining claim relates;
 - (ii) the discovery, as defined in section 1 of the Petroleum (Exploration and Production) Act, 1991 (Act 2 of 1991), of petroleum,within 30 days after such discovery; and
 - (j) in the case of a company, give to the Commissioner notice of any change of
 - (i) the name of such company;
 - (ii) the registered address and principal place of business of the company in Namibia;

- (iii) the directors of the company;
 - (iv) the share capital of the company;
 - (v) the beneficial owner of more than five per cent of the shares issued by such company,
- within 30 days as from such change.
- (k) in the case of a natural person, give to the Commissioner notice of any change of the address of such person within 30 days as from such change.
- (2) (a) If the holder of a mining claim referred to in subsection (1) fails to comply with the provisions of that subsection, the Commissioner may at any time by notice in writing addressed and delivered to such holder, direct such holder to take, within the period specified in such notice, such steps as may be so specified.
- (b) A holder referred to in paragraph (a) who contravenes or fails to comply with a direction given under that paragraph shall be guilty of an offence and on conviction be liable to a fine not exceeding R8 000 or to imprisonment for a period not exceeding 12 months or to both such fine and such imprisonment.
- (c) If the holder referred to in paragraph (a) fails to take to the satisfaction of the Commissioner the steps specified in the notice so referred to within the period specified in such notice or such further period as the Commissioner may on good cause shown allow, the Commissioner may cause such steps to be taken, and recover in a competent court the costs incurred thereby from such holder.
- (3) The Commissioner may cause any beacons pointed out in terms of paragraph (d) of subsection (1) to be surveyed and may enter the longitude and latitude coordinates of such beacons so determined into the register referred to in section 36(2).

42. Work programmes of prospecting operations and mining operations.

(1) The holder of a mining claim who is, by virtue of the terms and conditions of registration of such mining claim, required to carry on, within a particular period and in accordance with a work programme, certain mining operations, prospecting operations or other operations referred to in paragraph (c) of subsection (1) of section 31, or to expend certain expenditure, shall furnish the Commissioner on such date or dates as may be determined by the Commissioner and made known by notice in writing addressed and delivered to such holder, with particulars of such mining operations, prospecting operations, other operations or expenditure.

(2) The Minister may, on application made to him or her by the holder of a mining claim, by notice in writing addressed and delivered to such holder, amend any work programme or expenditure referred to in subsection (1) in accordance with proposals contained in such application or to such extent as the Minister may deem appropriate.

(3) The holder of a mining claim who contravenes or fails to comply with the requirements of a work programme referred to in subsection (1) shall be guilty of an offence and on conviction be liable to a fine not exceeding R8 000 or to imprisonment for a period not exceeding 12 months or to both such fine and such imprisonment.

43. Abandonment of mining claims.

(1) The holder of a mining claim may abandon such mining claim by notice in writing addressed and delivered to the Commissioner and shall together with such notice return the registration certificate of such claim, whereupon-

(a) the Commissioner shall-

- (i) cancel such registration certificate;
- (ii) make an entry to that effect in the register of mining claims referred to in section 36(2);
- (iii) notify the person who was the holder of such mining claim that such registration certificate has been cancelled; and
- (iv) notify the owner of the land on which such claim was situated of such abandonment and provide such owner with a sketch plan of such mining claim referred to in section 33(2)(e); and

(b) such mining claim shall be deemed to have been abandoned on the date on which such registration certificate has been cancelled as provided in subparagraph (i) of paragraph (a).

(2) If a mining claim is abandoned as contemplated in subsection (1), the holder of such such mining claim shall-

(a) within 30 days as from the date of the cancellation of the registration certificate as provided in subsection (1), remove all beacons erected by him or her on such claim and, in the case of a beacon used as a joint beacon, his or her peg and beacon plate without causing damage to any other part of such beacon;

(b) demolish any accessory work erected or constructed by such person in the claim area to which the mining claim related, except in so far as the owner of the land retains such accessory works on such terms and conditions as may mutually be agreed upon between such owner and person, and remove from such land all debris and any other object brought onto such land; and

(c) take all such steps as may be necessary to remedy to the reasonable satisfaction of the Minister any damage caused by any prospecting operations and mining operations carried on by such holder to the surface of, and the environment on, the land in the claim area in question.

(3) The abandonment of a mining claim shall not affect any legal proceedings instituted against such holder or any obligation or liability of such holder in terms of the provisions of this Act.

(4) Any person who contravenes or fails to comply with the provisions of subsection (2) shall be guilty of an offence and on conviction be liable to a fine not exceeding R8 000 or to imprisonment for a period not exceeding 12 months or to both such fine and such imprisonment.

44. Cancellation of registration of mining claims.

(1) The provisions of section 55 shall apply *mutatis mutandis* in relation to the cancellation of the registration of any mining claim.

(2) For purposes of the application of section 55, as applied by subsection (1) of this section -

- (a) any reference to the Minister, shall be construed as a reference to the Commissioner;
- (b) any reference to the holder of a mineral licence, shall be construed as a reference to the holder of a mining claim; and
- (c) any reference to a mineral licence, shall be construed as a reference to the registration of a mining claim.

45. Records, maps, plans and financial statements to be kept, and information, reports and returns to be submitted, by holders of mining claims.

(1) The holder of a mining claim –

- (a) shall keep at an address in Namibia a proper record in such form as may be determined in writing by the Commissioner in relation to-
 - (i) any mining operations referred to in section 31 (1)(a) -
 - (aa) the nature, appraisal and results of all mining operations carried on in the claim area to which such mining claim relates;
 - (bb) the nature and mass or volume of any mineral or group of minerals won or mined on such mining claim and treated or stockpiled on such mining claim or elsewhere;
 - (cc) the nature, mass or volume and value of any mineral or group of minerals so won or mined, sold or otherwise disposed of and the full names and address of any person to whom such mineral or group of minerals was sold or otherwise disposed of;
 - (dd) the nature and mass or volume of any waste removed from such mining claim and the manner in which it was disposed of;

- (ee) the persons employed by such holder for purposes of such mining operations, including the full names, addresses, nationality and ages of, and remuneration and other benefits paid and granted to such persons;
 - (ff) the unit operating and off-mine costs incurred;
 - (gg) the expenses incurred by such holder in the course of such mining operations; and
 - (hh) such other work carded on in the course of such mining operations as may be determined by the Commissioner and specified by notice in writing addressed and delivered to such holder; and
- (ii) any, prospecting operations referred to in section 31(1)(b)-
- (aa) the nature, location and results of all prospecting operations carried on by such holder, and the interpretation and assessment of such operations;
 - (bb) the nature and mass or volume of any mineral or group of minerals found or incidentally won in the course of such prospecting operations;
 - (cc) the persons employed by such holder for purposes of such prospecting operations, including the full names, addresses, nationality and ages of, and remuneration and other benefits paid and granted to such persons;
 - (dd) the expenses incurred by such holder in the course of such prospecting operations; and

(ee) such other work carried on in the course of such prospecting operations as may be determined by the Commissioner and specified by notice in writing addressed and delivered to such holder,

and shall retain such records for a period of not less than three years;

- (b) shall prepare or cause to be prepared and maintain at all times plans and maps in respect of the claim area;
- (c) shall prepare, in respect of each year of assessment, as defined in section 1 of the Income Tax Act, 1981 (Act 24 of 1981), of such holder during the registration of such mining claim, a statement of income and expenditure derived or incurred in connection with any prospecting operations and mining operations on such mining claim, including a balance sheet and profit and loss account, and such other financial statements as the Commissioner may require in such form as the Commissioner may determine;
- (d) shall submit within 15 days after the end of each month or such longer period as the Commissioner may, on good cause shown, determine in writing during the currency of the registration of such mining claim to the Commissioner in such form as may be so determined by the Commissioner a return or returns containing in relation to such month or period-
- (i) such summary of the particulars and information contained in the records referred to in paragraph (a)(i), excluding item (ff) thereof, as may be required by the Commissioner and indicated in such form or requested by the Commissioner by notice in writing addressed and delivered to such holder; and
- (ii) such other particulars as the Commissioner may require in relation to the prospecting operations and mining operations carried on by such holder on such mining claim;

- (e) shall submit within 60 days after 31 December in each year to the Commissioner in such form as may be determined in writing by the Commissioner -
- (i) a return containing in relation to such year-
- (aa) a summary of the particulars and information contained in the records referred to in paragraph (a)(i) as may be required by the Commissioner and indicated in such form or otherwise requested by the Commissioner by notice in writing addressed and delivered to such holder;
 - (bb) an estimate of the remaining mineral reserves in such mining claim properly illustrated by way of plans and maps according to an appropriate scale;
 - (cc) particulars of any proposed mining operations during the succeeding year, together with a forecast of the source of such mining operations in terms of delineated mineral reserves; and
 - (dd) such other particulars as the Commissioner may require in relation to the prospecting operations and mining operations carried on by such holder on such mining claim;
- (ii) the statement of income and expenditure and financial statements referred to in paragraph (c); and
- (f) shall submit, together with an application referred to in section 31(l)(b)(i) or an application for the renewal of the registration of a mining claim referred to in section 38 in respect of the whole of the claim area or an application for a mineral deposit retention licence or a mining licence in respect of the whole or any portion of the mining claim, to the Commissioner in such form as may be determined in writing by the Commissioner-

- (i) a report in duplicate or, in the case where application is made for a mineral deposit retention licence or a mining licence in respect of a portion of the mining claim, separate reports in duplicate in respect of such portion and the remainder of such claim area, containing in relation to the period immediately before the date of such application, reckoned from the date of registration of such mining claim or the date of renewal of such registration, as the case may be—
 - (aa) all information in the records referred to in paragraph (a) and the plans and geological maps referred to in paragraph (b);
 - (bb) an estimate of the remaining mineral reserves in such mining claim properly illustrated by way of plans and maps according to an appropriate scale; and
 - (cc) such other particulars as the Commissioner may require in relation to the prospecting operations carried on by such holder; and
- (ii) the statement of income and expenditure and financial statements referred to in paragraph (c) in relation to the period, immediately before the date of such application, reckoned from the date of registration of such mining claim or the date on which the last such statements have been submitted in terms of paragraph (e)(ii).

(2) In the event of the cancellation of the registration of a mining claim under section 44 or the lapsing of such registration, the person who was the holder of such mining claim immediately before such cancellation or lapsing shall on a date not later than one month after the date of such cancellation or lapsing deliver to the Commissioner

- (a) all records kept in terms of the provisions of subsection (1)(a);
- (b) all maps and plans referred to in subsection (1)(b);

- (c) all reports, photographs, tabulations, tapes and discs prepared by or on behalf of such person in the course of any prospecting operations and mining operations carried on in such mining claim; and
- (d) such other books, documents, records and reports as the Commissioner may require by notice in writing addressed and delivered to such person,

or copies of such records, maps, plans, reports, photographs, tabulations, tapes, discs, books and documents, unless a mineral deposit retention licence or a mining licence is issued to such person in relation to the area to which such mining claim related with effect from the date following on the date of such cancellation or lapsing or such later date as the Commissioner may on good cause shown allow.

(3) If the holder referred to in subsection (2) fails to comply with the provisions of that subsection the Commissioner may *mutatis mutandis* in accordance with the provisions of Chapter 2 of the Criminal Procedure Act, 1977 (Act 51 of 1977) -

- (a) enter upon any premises whatsoever and search for the records, maps and plans, reports, photographs, tabulations, tapes, discs, books and documents referred to in paragraphs (a) to (d) of subsection (2);
- (b) seize any such records, maps and plans, reports, photographs, tabulations, tapes, discs, books and documents,

as if he or she were a police official referred to in that Act and such records, maps and plans, reports, photographs, tabulations, tapes, discs, books and documents were concerned in the commission of any offence.

(4) Any person referred to in subsection (1) or (2) who contravenes or fails to comply with the provisions of that subsection shall be guilty of an offence and on conviction be liable to a fine not exceeding R8 000 or to imprisonment for a period not exceeding 12 months or to both such fine and such imprisonment.

PART VIII**General provisions relating to mineral licences****46. Persons who may apply for, or for transfer of, mineral licences or for approval to grant, cede or assign interests in such licences or to be joined as joint holders of such licences or interests.**

Subject to the provisions of this Act, a mineral licence shall not be granted or transferred or any interest in such mineral licence be granted, ceded or assigned to any person other than -

- (a) a company; or
- (b) a Namibian citizen who has reached the age of 18 years and who, in the opinion of the Minister, is a fit and proper person to hold such licence,

and no person other than such person shall be joined as a joint holder of any such mineral licence or interest.

47. Applications for, or for renewal or transfer of, mineral licences, or for approval to grant, cession or assignment of interests in mineral licences, or to be joined as joint holders of such mineral licences or interests.

(1) Subject to the provisions of this Act, an application for—

- (a) a mineral licence or the renewal thereof;
- (b) the amendment of a mineral licence; or
- (c) the approval of the Minister for the transfer of a mineral licence, or the grant, cession or assignment of any interest in any mineral licence, or to be joined as a joint holder of a mineral licence or such interest,

shall be made to the Minister in such form as may be determined in writing by the Commissioner and shall be accompanied by such application fee and such licence fee as may be payable in respect of the licence period or first licence period, as the case may be, of such licence as may be determined under section 123.

(2) Subject to the provisions of this Act, the Minister—

- (a) may grant on such terms and conditions as may be determined in writing by him or her, or refuse to grant an application referred to in subsection (1); or

(b) shall grant an application for the transfer of its mineral licence referred to in paragraph (c) of subsection (1) where such mineral licence is to be transferred from a company which is the holder of such mineral licence to a company which is controlling, controlled by or under common control with such holder, if the Minister is on reasonable grounds satisfied that such holder is not contravening or failing to comply with the terms and conditions of such licence or any other mineral licence held by it or any provision of this Act.

(3) The provisions of section 39(6), (7) and (8) shall apply *mutatis mutandis* in relation to the transfer of a mineral licence or the granting, cession or assignment of any interest in a mineral licence or the joinder of a person as a joint holder of such mineral licence or interest.

48. Powers of Minister in respect of applications for, or for renewal or transfer of, mineral licences or for approval for grant, cession or assignment of interests in mineral licences, or to be joined as joint holders of such mineral licences or interests.

(1) The Minister may at any time after the receipt of any application referred to in section 47 require the person concerned by notice in writing—

- (a) to furnish him or her within such reasonable period as may be specified in such notice with -
- (i) such information specified in such notice as the Minister may in his or her discretion deem necessary to enable him or her to determine who, in the case of a company, has the controlling interest in the affairs of the company; and
 - (ii) such other information so specified as the Minister may in his or her discretion deem necessary for purposes of considering such application;
- (b) to publish particulars of the application in relation to -
- (i) the full names of such person; and
 - (ii) the area, the kind of mineral licence and the mineral or group of minerals to which such application relates,

in such manner as may be specified in such notice;

(c) to give the particulars of the application -

(i) referred to in paragraph (b);

(ii) relating to the condition of, and any existing damage to, the environment in the area to which the application relates;

(iii) relating to an estimate of the effect which the proposed prospecting operations or mining operations, as the case may be, may have on the environment and the proposed steps to be taken in order to prevent or minimize such effect,

in such manner and to such person or persons as may be specified in such notice.

(3) In order to enable the Minister to consider any application referred to in section 47 the Minister may –

(a) cause such investigations to be made or undertaken as the Minister may in his or her discretion deem necessary;

(b) require the person concerned by notice in writing –

(i) to carry out or cause to be carried out such environmental impact studies as may be specified in the notice;

(ii) to furnish the Minister within such period as may be specified in such notice with such proposals, by way of alteration to or in addition to proposals set out in the application, as may be so specified.

(3) In considering any application referred to in section 47 and the terms and conditions subject to which such application may be granted, the Minister shall take into account the need to conserve and protect the natural resources in, on or under the land to which the application relates and in, on or under adjoining or neighbouring land.

(4) If the Minister is, after having considered an application referred to in section 47, prepared to grant the application subject to certain terms and conditions, he or she shall direct that notice be given to the person concerned in which the terms and conditions, in addition to the term and conditions referred to in section 50, are set out on which he or she is prepared to grant such application.

(5) The person referred to in subsection (4) may, within one month as from the date of that notice or such further period as the Minister may on good cause shown allow in writing, agree in writing to accept such terms and conditions or such other terms and conditions as may be agreed upon.

(6) If the person making an application referred to in section 47 fails -

(a) to comply with the requirements of any notice referred to in subsection (1) or (2)(b); or

(b) to agree as contemplated in subsection (5),

within the period specified in such notice or such further period as the Minister may on good cause shown allow in writing, the application in question shall lapse on the expiration of such period.

49. Mineral agreements.

(1) The Minister may, before a mineral licence is issued and at the request of the person making an application referred to in section 47, enter into an agreement not inconsistent with the provisions of this Act with such person containing the terms and conditions agreed upon as provided in section 48(4) and (5) on which such mineral licence will be issued.

(2) A mineral agreement -

(a) shall contain the full names and address of the person concerned and, in the case of a company, particulars of its incorporation and registration as a company, the registered address and principal place of business of the company in Namibia, the full names and nationality of the directors of the company, the share capital of the company and the full names and nationality of any person who is the beneficial owner of more

than five per cent of the shares issued by such company; or

(b) may include terms and conditions relating to-

- (i) minimum reconnaissance operations, prospecting operations or mining operations to be carried on and the time table determined for purposes of such operations;
- (ii) the minimum expenditure in respect of reconnaissance operations, prospecting operations or mining operations;
- (iii) the formation of joint ventures or the operation of production sharing or other joint arrangements;
- (iv) the participation, including the acquisition of equity share capital, by the State or any other person in any ventures or arrangements referred to in subparagraph (iii);
- (v) the manner in which reconnaissance operations, prospecting operations or mining operations shall be carried out;
- (vi) the processing, whether wholly or partly, within Namibia of any mineral or group of minerals found, won or mined by the holder of a mineral licence in the course of any prospecting operations or mining operations;
- (vii) the basis on which the market value of any mineral or group of minerals in question may from time to time be determined
- (viii) the utilization of any profits derived by the holder of a mineral licence from any reconnaissance operations, prospecting operations or mining operations carried on under such mineral licence;
- (ix) guarantees to ensure the due and proper performance of the liabilities and obligations under a mineral licence;

- (x) financial and insurance arrangements;
- (xi) the application of any of the fiscal laws in force in Namibia;
- (xii) arbitration in the event of any dispute which may arise in the application of any term and condition contained in such agreement, whether in terms of the provisions of the Arbitration Act, 1965 (Act 42 of 1965) or by way of any international arbitration tribunal specified in such agreement;
- (xiii) co-ordination of prospecting operations or mining operations to be carried on by the person concerned in terms of a mineral licence with any prospecting operations or mining operations carried on by any other holder of a mineral licence in any neighbouring prospecting area or mining area.

(3) Any term and condition contained in an agreement referred to in subsection (1) which is inconsistent with any provision of this Act shall, to the extent it is so inconsistent, be null and void.

(4) Nothing contained in an agreement referred to in subsection (1) shall be construed as absolving any party thereto from any requirement laid down by law or from applying for, and obtaining, any permit, licence, approval, permission or other document required by law.

50. General terms and conditions of mineral licences.

In addition to any term and condition contained in a mineral agreement and any term and condition contained in any mineral licence, it shall be a term and condition of any mineral licence that the holder of such mineral licence shall -

- (a) exercise any right granted to him or her in terms of the provisions of this Act reasonably and in such manner that the rights and interests of the owner of any land to which such licence relates are not adversely affected, except to the extent to which such owner is compensated;

- (b) in the employment of employees, give preference to Namibian citizens who possess appropriate qualifications, expertise and experience for purposes of the operations to be carried on in terms of such mineral licence;
- (c) carry out training programmes in order to encourage and promote the development of Namibian citizens employed by such holder;
- (d) with due regard to the need to ensure technical and economic efficiency, make use of products or equipment manufactured or produced, and services available, within Namibia;
- (c) co-operate with other persons involved in the mining industry in order to enable such citizens to develop skills and technology to render services in the interest of that industry in Namibia;
- (f) prepare in such form as may be determined in writing by the Commissioner for the approval of the Commissioner-
 - (i) an environmental impact assessment indicating the extent of any pollution of the environment before any prospecting operations or mining operations are being carried out and an estimate of any pollution, if any, likely to be caused by such prospecting operations or mining operations;
 - (ii) if any pollution is likely to be so caused, an environmental management plan indicating the proposed steps to be taken in order to minimize or prevent to the satisfaction of the Commissioner any pollution of the environment in consequence of any prospecting operations or mining operations carried on by virtue of such mineral licence;
- (g) from time to time as circumstances change to revise such environmental management plan either out of his or her own motion or if required by the Commissioner;
- (h) in the case of a company, give to the Commissioner notice of any change of-

- (i) the name of such company;
- (ii) the registered address and principal place of business of the company in Namibia;
- (iii) the directors of the company;
- (iv) the share capital of the company;
- (v) the beneficial owner of more than five per cent of the shares issued by such company,

within 30 days as from such change.

- (i) in the case of a natural person, give to the Commissioner notice of any change of the address of such person within 30 days as from such change.

51. Register of mineral licences.

(1) The Commissioner shall keep and maintain a register of mineral licences in such form as may be determined in writing by the Commissioner in which shall be recorded in respect of every mineral licence issued -

- (a) the full names and such other particulars of the holder and joint holder of a mineral licence or interest in such mineral licence in whose name such mineral licence has been issued or to whom such mineral licence or interest has been transferred or to whom an interest in such mineral licence has been granted, ceded or assigned as may be determined in writing by the Commissioner and, in the case of a holder or joint holder of a mineral licence who is resident outside Namibia, the full names and address of his or her accredited agent;
- (b) the date on which such mineral licence has been issued or transferred or any interest in such mineral licence has been granted, ceded or assigned or a person has been joined as joint holder of such mineral licence or interest;
- (c) the date on which such mineral licence has been renewed and the date on which such mineral licence will lapse in terms of the provisions of this Act;

- (d) the nature of such mineral licence;
- (e) particulars of the area of land to which such mineral licence relates;
- (f) the mineral or group of minerals in respect of which such mineral licence has been issued;
- (g) particulars of any permissions granted under any provision of this Act in relation to such mineral licence;
- (h) the date on which such mineral licence is cancelled in terms of section 55;
- (i) particulars of any agreement or ancillary right referred to in section 52(1)(a);
and
- (j) such other particulars as may in the opinion of the Commissioner be necessary for purposes of carrying out the provisions of this Act to effect an efficient system of registration of mineral licences and any interests in such mineral licences.

(2) A copy of any mineral licence issued in terms of this Act and the register referred to in subsection (1) shall during ordinary office hours be open for inspection by any person free of charge, and any person may on payment of such fee as may be determined under section 123 obtain copies of such mineral licence or extracts from such register.

- (3) A person who fraudulently-
 - (a) makes or causes to be made any entry in the register referred to in subsection (1) which is false;
 - (b) prepares or submits any extract of an entry in such register which is false or causes such an extract to be prepared or submitted,

shall be guilty of an offence and on conviction liable to a fine not exceeding R8 000 or to imprisonment for a period not exceeding 12 months or to both such fine and such imprisonment.

52. Restrictions on exercise of rights by holders of mineral licences.

(1) The holder of a mineral licence shall not exercise any rights conferred upon such holder by this Act or under any terms and conditions of such mineral licence

- (a) in, on or under any private land until such time as such holder
 - (i) has entered into an agreement in writing with the owner of such land containing terms and conditions relating to the payment of compensation, or the owner of such land has in writing waived any right to such compensation and has submitted a copy of such agreement or waiver to the Commissioner; or
 - (ii) has been granted an ancillary right as provided in section 110(4) to exercise such rights on such land;
- (b) in, on or under any-
 - (i) town or village;
 - (ii) land comprising a proclaimed road, including such parts adjoining such road as may in terms of any law governing such road be regarded as the road reserve, aerodrome, harbour, railway or cemetery; or
 - (iii) land used or reserved for any governmental or public purpose,

and otherwise in conflict with any law, if any, in terms of which such town, village, road, aerodrome, harbour, railway, cemetery or land has been established, erected, constructed or is otherwise regulated, without the prior permission of the Minister granted, upon an application to the Minister in such form as may be determined in writing by the Commissioner, by notice in writing and subject to such conditions as may be specified in such notice;
- (c) in, on or under any land in respect of which no person other than the holder of a reconnaissance licence is, by virtue of a notice issued in terms of section 122, entitled to carry on any prospecting operations or mining operations;

- (d) in, on or under any private or State land-
- (i) used as a garden, orchard, vineyard, nursery, plantation or which is otherwise under cultivation;
 - (ii) within a horizontal distance of 100 metres of any spring, well, borehole, reservoir, dam, dipping-tank, waterworks, perennial stream or pan, artificially constructed watercourse, kraal, building or any structure of whatever nature;
 - (iii) within a horizontal distance of 300 metres from any point on the nearest boundary of any erf, as defined in section 1 of the Townships and Division of Land Ordinance, 1963 (Ordinance 11 of 1963) if such erf has been surveyed for the purpose of inclusion in a township as defined in that section; or
 - (iv) on which accessory works were erected or constructed under this Act and which existed at the time of the issue of the mineral licence in question, without the prior permission in writing of the owner of such land, and, in the case of land referred to in subparagraph (iv), of the holder of a mineral licence who has erected or constructed such accessory works on which it is proposed to exercise such right;
- (e) in, on or under any land subject to a production licence, as defined in section 1 of the Petroleum (Exploration and Production) Act, 1991 (Act 2 of 1991), which existed at the time of the issue of the licence in question, without the prior permission in writing of the holder of the production licence concerned; and
- (f) which in any way will interfere with fishing or marine navigation, without the prior permission of the Minister granted, upon an application to the Minister in such form as may be determined in writing by the Commissioner, by notice in writing and subject to such conditions as may be specified in such notice.

(2) When, in the course of any prospecting operations or mining operations in any prospecting area, mining area or retention area, as the case may be, any damage is caused or done to the surface of any land or to any water source, cultivation, building or other structure therein or thereon as a result of such operations, the holder of the mineral licence in question shall be liable to pay compensation to the owner of the land, water source, cultivation, building or other structure, as the case may be, in relation to which such damage has been caused or done.

(3) When a dispute arises between the holder of a mineral licence and the owner referred to in subsection (2) in relation to the liability for, or the amount of, compensation payable under that subsection, such holder or owner, or such holder and owner, may make application in writing to the Commission to have the matter determined as provided in section 110.

(4) The provisions of subsection (3) shall not be construed as prohibiting an owner referred to in the said subsection (3) or an authority administering land from instituting civil proceedings in any competent court against the holder of a mineral licence for the payment of compensation in respect of any damage referred to in the said subsection (2).

(5) When the owner of land or any authority administering land on which prospecting operations or mining operations are being carried on in an application to the Minister -

- (a) states that such operations prevent the proper use of the land wholly or partly for farming purposes; and
- (b) requests that the holder of the mineral licence concerned carrying on such operations be required to purchase so much of the land as cannot be so used,

the Minister may, if he or she is on reasonable grounds satisfied that such operations prevent the land from being so used, by notice in writing addressed and delivered to such holder, direct such holder to purchase so much of the land as cannot be so used on such conditions as may be specified in such notice, and shall notify the owner of the land in question accordingly.

(6) When the holder of a mineral licence and the owner of land or an authority administering land are unable to agree on the price to be paid for land to which a direction under subsection (5) relates, the price and mode of payment shall be fixed by arbitration.

(7) Any person who contravenes or fails to comply with the provisions of subsection (1) or any direction referred to in subsection (5) shall be guilty of an offence and on conviction liable to a fine not exceeding R8 000 or to imprisonment for a period not exceeding 12 months or to both such fine and such imprisonment.

53. Drilling of boreholes.

(1) Any holder of a mineral licence shall not drill in connection with any prospecting operations or mining operations any borehole or boreholes from the surface of any land or resume the drilling of any such borehole or boreholes which has been discontinued for a period of more than three months, unless such holder has given the Commissioner notice in such form as may be determined in writing by the Commissioner of such holder's intention to so drill any such borehole or boreholes.

(2) A holder of a mineral licence referred to in subsection (1) shall, at the request in writing of the Commissioner and within such period as may be so determined by him or her, furnish the Commissioner with a report in such form as may be so determined by the Commissioner, containing particulars relating to -

- (a) the location, direction and depth of such borehole;
- (b) the geological formations through which such borehole was drilled;
- (c) the widths and assay values of any mineral or group of minerals intersected in such borehole; and
- (d) such other information as the Commissioner may require.

(3) A holder of a mineral licence referred to in subsection (1) or a person who was at any time such a holder shall not destroy or dispose of or cause to be destroyed or disposed of any borehole core or other material derived from any borehole referred to in that subsection except-

- (a) with the prior approval in writing of the Commissioner; or
 - (b) in so far as it is reasonably necessary to destroy such core or material in the course of any analytical or metallurgical testing.
- (4) (a) The Commissioner may by notice in writing addressed and delivered to the holder or person referred to in subsection (3) require such holder or person to deliver to the Commissioner in such manner as may be specified in such notice at such holder's or person's own costs-
- (i) in the case of any such holder, in the course of drilling operations, any borehole core or other material referred to in subsection (3) or any sample of such borehole core or other material; or
 - (ii) in the case of any such holder or person, after the completion of drilling operations any borehole core, other material or sample so referred to or any part thereof.
- (b) The Commissioner shall -
- (i) issue a receipt in respect of any borehole core, other material or sample thereof delivered in terms of paragraph (a); and
 - (ii) upon any claim received from the holder of a mineral licence or person referred to in paragraph (a) other than a holder or person who has applied for or obtained the approval contemplated in subsection (3)(a), return such borehole core, other material or sample to such holder or person, or pay to such holder or person an amount equal to the market value of any such borehole core, other material or sample.
- (5) Any person who contravenes or fails to comply with the provisions of this section or any notice referred to in subsection (4) shall be guilty of an offence and on conviction liable to a fine not exceeding R8 000 or to imprisonment for a period not exceeding 12 months or to both such fine and such imprisonment.

54. Abandonment of reconnaissance areas, prospecting areas, retention areas and mining areas.

(1) The holder of a mineral licence may abandon the reconnaissance area, prospecting area, retention area or mining area to which such licence relates by notice in writing addressed and delivered to the Commissioner and shall together with such notice return such mineral licence, whereupon –

(a) the Commissioner shall-

(i) cancel such mineral licence;

(ii) make an entry to that effect in the register of mineral licences referred to in section 51;

(iii) notify the person who was the holder of such mineral licence that such mineral licence has been cancelled; and

(iv) notify the owner of the land on which such area was situated of such abandonment; and

(b) such area shall be deemed to have been abandoned on the date on which such mineral licence has been cancelled as provided in subparagraph (i) of paragraph (a).

(3) If a reconnaissance area, prospecting area, retention area or mining area is abandoned as provided in subsection (1), the holder of the mineral licence to which such area relates shall –

(a) demolish any accessory works erected or constructed by such person in such area, except in so far as the owner of the land retains such accessory works on such conditions as may mutually be agreed upon between such owner and person, and remove from such land all debris and any other object brought onto such land;

(b) take all such steps as may be necessary to remedy to the reasonable satisfaction of the Minister any damage caused by any prospecting operations and mining operations carried on by such holder to the surface of, and the environment on, the land in the area in question.

(3) The abandonment of a reconnaissance area, prospecting area, retention area or Suing area shall not affect any legal proceeding instituted against such holder or any obligation or liability of such holder in terms of the provisions of this Act.

(4) Any person who contravenes or fails to comply with the provisions of subsection (2) shall be guilty of an offence and on conviction be liable to a fine not exceeding R8 000 or to imprisonment for a period not exceeding 12 months or to both such fine and such imprisonment.

55. Cancellation of mineral licences.

(1) Subject to the provisions of section 56 and subsections (2) and (3) of this section, the Minister may by notice in writing addressed and delivered to the holder of a mineral licence, cancel the mineral licence of such holder or, in the case of two or more persons who are the joint holders of such mineral licence or interest, cancel the mineral licence in respect of any one or more of such holders, if-

- (a) any such holder fails to comply with the terms and conditions of such mineral licence or of the provisions of this Act;
- (b) in the case of a company, such company is wound up in terms of the provisions of the Companies Act, 1973 (Act 61 of 1973), unless such company has been wound up for purposes of an amalgamation or reconstruction, as contemplated in that Act, and has obtained the prior approval of the Minister for such amalgamation or reconstruction;
- (c) in the case of a natural person, such person's estate is sequestrated.

(2) The Minister shall not under subsection 1(a) cancel a mineral licence so referred to, unless -

- (a) the Minister has by notice in writing informed the holder of such mineral licence of his or her intention to cancel such mineral licence -
 - (i) setting out particulars of the alleged failure; and

- (ii) calling upon such holder to make such representations to the Minister as such holder may deem necessary or expedient within such period, but not less than 30 days as from the date of such notice, as may be specified in such notice;
- (b) the Minister has considered-
- (i) any steps taken by such holder to remedy the failure in question or to prevent any such failure from being repeated during the currency of the mineral licence; and
 - (ii) any other matters submitted to the Minister by way of the representations made under paragraph (a)(ii); and
- (c) in the case of a holder of a mineral licence who has failed to pay any amount payable by such holder in terms of this Act or by virtue of the terms and conditions of the mineral licence in question, such holder has, before the date specified in the notice referred to in paragraph (a), paid any such amount, together with any interest payable in respect of such amount.
- (3) The Minister may, on application in writing made to him or her by the holder of a mineral licence in such form as may be determined in writing by the Commissioner and on payment of such fee, if any, as may be determined under section 123, cancel by notice in writing any mineral licence.
- (4) The cancellation of a mineral licence in terms of the provisions of this section shall not affect any liability or obligation incurred in relation to anything done under or by virtue of the terms and conditions of such mineral licence.

56. *Vis Major*

- (1) Any failure by the holder of a mineral licence to comply with any term and condition of such mineral licence or any provision of this Act shall not be regarded as being a failure to comply with such term and condition or provision in so far as such holder was prevented from complying with such term and condition or provision due to an arm of war, hostility or insurrection or an act of God.

(2) The holder of a mineral licence who is prevented from complying with a term and condition or provision as contemplated in subsection (1) shall forthwith inform the Minister by notice in writing setting out particulars of the nature, extent and causes of such holder's failure to comply with the term and condition of provision specified in such notice.

(3) The Minister may, on application made to him or her by the holder of a mineral licence referred to in subsection (2) who has been prevented from exercising any rights under such mineral licence for any period in the circumstances contemplated in subsection (1), extend by notice in writing on such conditions as may be so determined by the Minister the period for which the mineral licence in question has been issued, by such period as may be so determined by the Minister with due regard to the provisions of this Act relating to the period after which mineral licences of the nature of the mineral licence in question expire.

(4) The Minister may refuse any application referred to in subsection (3) if the holder of the mineral licence concerned could, by taking such reasonable steps as may have been available to such holder, have exercised such rights during that period.

(5) The provisions of this section shall not be construed as absolving any holder of a mineral licence from complying with any liability or obligation under a mineral licence or this Act to pay any royalties, annual charges, rent or fees

57. Directions to holders of mineral licences.

(1) The Minister may, with due regard to good reconnaissance practices, good prospecting practices or good mining practices by notice in writing addressed and delivered to the holder of a mineral licence, give directions to such holder in relation to -

- (a) the carrying on of reconnaissance operations, prospecting operations and mining operations, including the erection or construction of any accessory works;
- (b) the protection of the environment;

- (c) the conservation of any natural resources, including mineral resources, and the prevention of the waste of such resources;
- (d) the construction, erection, maintenance, operation or use of accessory works
- (e) the removal of accessory works or other goods erected, constructed or brought on land in connection with the prospecting for, or the mining or conveyance of, any mineral or group of minerals which is not used or intended to be used in connection with such prospecting, mining or conveyance;
- (c) the discovery of any mineral or group of minerals;
- (g) the taking, preservation and furnishing to the Commissioner of cores, cuttings or samples of any mineral or group of minerals obtained or which may be obtained in the course of reconnaissance operations, prospecting operations and mining operations;
- (h) the submission to the Commissioner of reports, returns and other information,

and the Minister may, if such holder fails to comply, within such period as may be specified in such notice or such further period as the Minister may on good cause shown allow in writing, with such directions to the satisfaction of the Minister, cause such steps to be taken as may be necessary to comply with such directions, and may recover from such holder in a competent court the costs incurred in connection with the taking of such steps.

(2) Any holder of a mineral licence who contravenes or fails to comply with a notice issued under subsection (1) shall be guilty of an offence and on conviction be liable to a fine not exceeding R8 000 or to imprisonment for a period not exceeding 12 months or to both such fine and such imprisonment.

PART IX
Provisions relating to reconnaissance licences

58. Rights of holders of reconnaissance licences.

(1) Subject to the provisions of this Act, a reconnaissance licence shall authorize the holder of such licence -

- (a) to carry on reconnaissance operations in the reconnaissance area to which such licence relates in respect of any mineral or group of minerals, whether or not a mineral licence has in terms of the provisions of this Act been issued to any other person or a mining claim has been registered in the name of any other person in respect of the land to which such reconnaissance licence relates;
 - (b) to carry on such other operations, including the erection or construction of accessory works in such reconnaissance area as may be reasonably necessary for, or in connection with, any reconnaissance operations contemplated in paragraph (a).
- (2) (a) The holder of a reconnaissance licence shall not erect or construct any accessory works referred to in subsection (1)(b) without the prior permission in writing of the Commissioner.
- (b) The Commissioner shall not grant the permission referred to in paragraph (a) in respect of accessory works to be erected or constructed on private land, unless the holder of the reconnaissance licence has complied with the provisions of section 52(1)(a) in relation to any compensation to be paid to the owner of such private land.
- (3) The provisions of subsection (1) shall not be construed as-
- (a) conferring on the holder of a reconnaissance licence any preferential right to any other licence during the currency or on expiry of such reconnaissance licence;

- (b) preventing the Minister from granting any other licence in respect of any mineral or group of minerals or any area of land in the reconnaissance area to which such reconnaissance licence relates; or
- (c) preventing any other person from pegging, and the Commissioner from registering, a mining claim in such reconnaissance area during the currency of such reconnaissance licence.

59. Exclusive rights to carry on reconnaissance operations.

- (1) Subject to the provisions of subsection (2), the Minister may, on application by
 - (a) a person applying for a reconnaissance licence, grant to such person a reconnaissance licence; or
 - (b) the holder of a reconnaissance licence, cause an endorsement to be made on such reconnaissance licence,

by virtue of which an exclusive right is conferred upon such person to carry on in the reconnaissance area to which such reconnaissance licence relates, reconnaissance operations in relation to any mineral or group of minerals specified in such licence, if the Minister is on reasonable grounds satisfied that the extent of the reconnaissance operations to be carried out and the expenditure to be incurred in or in relation to the reconnaissance area justifies the grant of such exclusive right.

- (2) An exclusive right referred to in subsection (1) shall not be granted in respect of
 - (a) any mining claim; or
 - (b) any area of land to which any other mineral licence, by virtue of which an exclusive right to carry on reconnaissance operations, prospecting operations or mining operations has been conferred, relates, to carry on reconnaissance operations for the same mineral or group of minerals.

60. Applications for reconnaissance licences.

An application by any person for a reconnaissance licence

- (a) shall contain -
- (i) in the case of a natural person the full names, nationality, date of birth, postal and residential address of such person;
 - (ii) in the case of a company, the name of such company and particulars of its incorporation and registration as a company, the registered address and principal place of business of the company in Namibia, the full names and nationality of the directors of the company, the share capital of the company and the full names and nationality of any person who is the beneficial owner of more than five per cent of the shares issued by such company; and
 - (iii) in the case of any person represented by an accredited agent the full names and address of such accredited agent;
- (b) shall be accompanied by a detailed plan of the area to which the application relates drawn according to scale of such area which shall not exceed two contiguous squares, each of which does not exceed one degree in longitude and one degree in latitude, indicating -
- (i) its location with reference to magisterial districts; and
 - (ii) the extent of such area defined by reference to coordinate reference points;
- (c) shall contain a concise geological description of the area of land and, in the case of an application for an exclusive right referred to in section 59, the mineral or group of minerals to which such application relates;
- (d) shall contain particulars of -
- (i) any licences issued in terms of this Act or any law repealed by this Act held by such person alone or jointly with any other person; and

- (ii) any prospecting operations and mining operations carried on by such person alone or jointly with any other person outside Namibia,

on the date of such application and during a period of 10 years immediately preceding such date;
- (e) shall contain particulars, substantiated by documentary proof or such other proof as may be required by the Commissioner, of the technical and financial resources of, or available to, such person to carry on the reconnaissance operations to which the application relates;
- (f) shall contain particulars of -
 - (i) the programme of reconnaissance operations proposed to be carried on, the estimated expenditure in respect thereof and the period within which such operations will be carried on and such expenditure will be expended;
 - (ii) in the case of an application for an exclusive right referred to in section 59, the reasons for such application;
- (g) shall be accompanied by such documents as the Minister may require in relation to any particulars referred to in this section; and
- (h) may contain any other matter which in the opinion of the person concerned is relevant to the application.

61. Restrictions on grant of applications relating to applications relating to reconnaissance licences.

The Minister shall not grant an application for a reconnaissance licence-

- (a) unless such person is a person referred to in section 46;
- (b) if, at the time of the application, such person is contravening any provision of this Act or any term and condition, direction or order determined, given or made under any such provision or is failing to comply with any provision of this Act, term and condition, direction or order;

- (c) unless the Minister is on reasonable grounds satisfied-
 - (i) with the programme of reconnaissance operations to be carded on or the expenditure to be expended in respect of such reconnaissance operations;
 - (ii) that the person concerned has the technical and financial resources to carry on such reconnaissance operations;
- (d) in respect of an area of land in relation to a mineral or group of minerals in respect of which an exclusive right has, in terms of section 59, been conferred on any other holder of a reconnaissance licence.

62. Issue of reconnaissance licences.

(1) Subject to subsections (4) and (5) of section 48, the Minister shall upon the granting of an application for a reconnaissance licence, direct the Commissioner to issue to the person who applied for such reconnaissance licence, a reconnaissance licence on such terms and conditions as may be agreed upon as provided in the said subsections.

- (2) Subject to the provisions of subsection (1), a reconnaissance licence shall-
 - (a) state the full names and address of the holder of the reconnaissance licence and, in the case of such a holder who is resident outside Namibia, the full names and address of such holder's accredited agent;
 - (b) state the date on which and the period for which such reconnaissance licence is issued;
 - (c) contain a diagram prepared by an officer employed in the Ministry of Mines and Energy and designated by the Permanent Secretary for that purpose of the area of land to which such reconnaissance licence relates containing geometrical or numerical depictions or any combination of such depiction and a description in words or symbols of such land;
 - (d) state the terms and conditions other than the terms and conditions referred to in section 50

subject to which such reconnaissance licence is issued;

- (e) state the mineral or group of minerals in respect of which such reconnaissance licence is issued; and
- (f) contain such other particulars as the Minister may, either generally or in any particular case, determine.

63. Duration of reconnaissance licences.

(1) Subject to the provisions of this Act, a reconnaissance licence shall be valid for such period, not exceeding six months, as may be determined in writing by the Minister at the time of the granting of such licence.

(2) Subject to the provisions of subsection (3), a reconnaissance licence shall not be subject to renewal.

(3) The Minister may, on an application in writing made to him or her by the holder of a reconnaissance licence in such form as may be determined in writing by the Minister, extend such licence on one occasion for a period not exceeding six months if the Minister is on reasonable grounds satisfied that such holder has during the currency of such licence been prevented through no fault of such holder to fully carry on the reconnaissance operations authorized under such licence.

(4) Notwithstanding the provisions of subsection (1), but subject to the other provisions of this Act, a reconnaissance licence shall not expire during a period in which

- (a) an application referred to in subsection (3) by such holder;
- (b) an application by such holder for an exclusive prospecting licence in respect of an area of, and in the reconnaissance area to which such reconnaissance licence relates or any mineral or group of minerals in respect of which an exclusive right has been conferred on such holder to carry on reconnaissance operations,

is being considered, until such application is refused or the application is withdrawn or has lapsed, whichever occurs first or, if such application is granted, until such time as the reconnaissance licence is extended or the exclusive prospecting licence is issued, as the case may be, in consequence of such application.

64. Transfer of reconnaissance licences, and grant, cession or assignment of interests in such licences, and joinder of persons as joint holders of such licences or interests.

A reconnaissance licence shall not be transferred and any interest in such licence shall not be granted, ceded or assigned to any other person, and no person shall be joined as a joint holder of such licence or interest.

65. Work programmes of reconnaissance operations.

The provisions of section 42 shall apply *mutatis mutandis* in relation to the holder of a reconnaissance licence, and in such application-

- (a) any reference to the holder of a mining claim, shall be construed as a reference to the holder of a reconnaissance licence;
- (b) any reference to prospecting operations or mining operations, shall be construed as a reference to reconnaissance operations; and
- (c) any reference to the registration of a mining claim, shall be construed as a reference to the issue of a reconnaissance licence.

66. Records, maps, plans and financial statements to be kept, and information, reports and returns to be submitted, by holders of reconnaissance licences.

(1) The holder of a reconnaissance licence-

- (a) shall keep at an address in Namibia a proper record in such form as may be determined in writing by the Commissioner in relation to
 - (i) the location and nature of all photogeological studies, imaging and geophysical and other surveys carried on by such holder in the course of the reconnaissance operations carried on by him or her in the reconnaissance area to which such reconnaissance licence relates, and the results, interpretation and assessment of such studies and surveys;
 - (ii) the persons employed by such holder for purposes of such reconnaissance operations, including the names, addresses, nationality and ages of, and remuneration and other benefits paid and granted to such persons;
 - (iii) the expenses incurred by such holder in the course of such reconnaissance operations; and

- (iv) such other work as may be determined by the Commissioner and specified by notice in writing addressed and delivered to such holder,
- and shall retain such records for a period of not less than three years as from the expiry of such licence;
- (b) shall prepare or cause to be prepared and maintain at all times plans and maps in respect of such reconnaissance area;
- (c) shall prepare in respect of the period of the currency of such reconnaissance licence a statement of income and expenditure derived or incurred in connection with such reconnaissance operations in such reconnaissance area and such other financial statements as the Commissioner may require in such form as the Commissioner may determine; and
- (d) shall submit, within 60 days after the end of the currency of such reconnaissance licence in respect of the whole of the reconnaissance area, or together with an application referred to in section 63(3) or an application for an exclusive prospecting licence or mining licence in respect of the whole or any portion of the reconnaissance area, to the Commissioner-
- (i) in such form as may be determined in writing by the Commissioner, a report in duplicate or, in the case where an application is made for an exclusive prospecting licence or mining licence in respect of a portion of the reconnaissance area, separate reports in duplicate in respect of such portion and the remainder of such reconnaissance area, setting out in relation to such period -
- (aa) an evaluation of the prospects of the discovery of any mineral or group of minerals in such reconnaissance area;

(bb) all information, including photographs, tabulations, tapes and discs, in the records referred to in paragraph (a) and the plans and maps referred to in paragraph (b); and

(cc) such other particulars as the Commissioner may require in relation to the reconnaissance operations carried on by such holder; and

(ii) the statement of income and expenditure and financial statements referred to in paragraph (c).

(2) In the event of the cancellation of a reconnaissance licence under section 55 the person who was the holder of such licence immediately before such cancellation shall on a date not later than 30 days after the date of such cancellation deliver to the Commissioner -

(a) all records kept in terms of the provisions of subsection (1)(a);

(b) all maps and plans referred to in subsection (1)(b);

(c) all reports, photographs, tabulations, tapes and discs prepared by or on behalf of such person in the course of such reconnaissance operations; and

(d) such other books, documents, records and reports as the Commissioner may require by notice in writing addressed and delivered to such person, or copies of such records, maps, plans, reports, photographs, tabulations, tapes, discs, books and documents, unless an exclusive prospecting licence or a mining licence is issued to such person in relation to the area to which such reconnaissance licence related with effect from the date following on the date of such cancellation or lapsing or such later date as the Commissioner may on good cause shown allow.

(3) If the holder referred to in subsection (2) fails to comply with the provisions of that subsection the Commissioner may *mutatis mutandis* in accordance with the provisions of Chapter 2 of the Criminal Procedure Act, 1977 (Act 51 of 1977) -

- (a) enter upon any premises whatsoever and search for the records, maps and plans, reports, photographs, tabulations, tapes, discs, books and documents referred to in paragraphs (a) to (d) of subsection (2);
 - (b) seize any such records, maps and plans, reports, photographs, tabulations, tapes, discs, books and documents, as if he or she were a police official referred to in that Act and such records, maps and plans, reports, photographs, tabulations, tapes, discs, books and documents were concerned in the commission of any offence.
- (4) Any person referred to in subsection (1) or (2) who contravenes or fails to comply with the provisions of any such subsection shall be guilty of an offence and on conviction be liable to a fine not exceeding R8 000 or to imprisonment for a period not exceeding 12 months or to both such fine and such imprisonment.

PART X

Provisions relating to exclusive prospecting licences

67. Rights of holders of exclusive prospecting licences.

- (1) Subject to the provisions of subsection (2) and the other provisions of this Act, the holder of an exclusive prospecting licence shall be entitled-
- (a) to carry on prospecting operations in the prospecting area to which such licence relates in respect of such mineral or group of minerals specified in such licence;
 - (b) to remove any mineral or group of minerals other than a controlled mineral or sample of such mineral or group of minerals, for any purpose other than sale or disposal, from any place where it was found or incidentally won in the course of prospecting operations referred to in paragraph (a) to any other place within Namibia;

- (c) with the permission of the Commissioner previously obtained generally or in every particular case in writing and subject to such conditions as may be determined by the Commissioner or subject to the conditions of an exemption granted under section 137 -
- (i) to remove any mineral or group of minerals referred to in paragraph (b) for any purpose other than sale or disposal, from any place where it was found or incidentally won in the course of prospecting operations referred to in paragraph (a) to any place outside Namibia;
 - (ii) to remove any controlled mineral or sample of such mineral, for any purpose other than sale or disposal, from any place where it was found or incidentally won in the course of prospecting operations referred to in paragraph (a) to any place, whether within or outside Namibia;
 - (iii) to remove any mineral or group of minerals, for purposes of sale or disposal, from any place where it was found or incidentally won in the course of such prospecting operations;
 - (iv) to sell or otherwise dispose of any such mineral or group of minerals;
- (d) to carry on such other operations, including the erection or construction of accessory works, as may be reasonably necessary for, or in connection with, such prospecting operations or selling or disposal contemplated in paragraph (a), (b) or (c).
- (2) The provisions of subsection (1) shall not be construed as-
- (a) conferring on the holder of an exclusive prospecting licence any preferential right to any other licence in relation to any mineral or group of minerals, other than a mineral or group of minerals to which such exclusive prospecting licence relates, during the currency or on expiry of such exclusive prospecting licence;

(b) preventing the Minister from granting to-

(i) any other person in respect of the prospecting area to which such exclusive prospecting licence relates -

(aa) a reconnaissance licence in respect of any mineral or group of minerals;

(bb) a reconnaissance licence by virtue of which an exclusive right is conferred upon the holder of such licence to carry on reconnaissance operations in respect of any mineral or group of minerals other than the mineral or group of minerals to which such exclusive prospecting licence relates;

(cc) an exclusive prospecting licence, mining licence or mineral deposit retention licence in respect of any mineral or group of minerals other than the mineral or group of minerals to which such first-mentioned exclusive prospecting licence relates;

(ii) any other holder of an exclusive prospecting licence approval to peg a claim in respect of any mineral or group of minerals to which such other holder's exclusive prospecting licence relates.

(3) (a) The holder of an exclusive prospecting licence shall not erect or construct any accessory works referred to in subsection (1)(d) without the prior permission in writing of the Commissioner.

(b) The Commissioner shall not grant the permission referred to in paragraph (a) in respect of accessory works to be erected or constructed on private land, unless the holder of such exclusive prospecting licence has complied with the provisions of section 52(1)(a) in relation to any compensation to be paid to the owner of such private land.

(4) An application for the permission referred to in subsection (1)(c) or (3) shall be made to the Commissioner in such form as may be determined in writing by the Commissioner and shall be accompanied by such application fee, if any, as may be determined under section 123, together with such documents and information as may be required by the Commissioner.

(5) The holder of an exclusive prospecting licence who has removed, as contemplated in paragraph (b) of subsection (1), any mineral or group of minerals other than a controlled mineral or any sample of such mineral or group of minerals from the place where it was found or incidentally won, for any purpose other than for sale or disposal, to any place within Namibia, shall, except to the extent to which such holder has been exempted, under the provisions of section 137, from the provisions of this subsection, inform the Commissioner in writing of such removal, not later than 14 days or such longer period as the Commissioner may allow after such removal, and provide particulars of the nature of such sample, mineral or group of minerals and the place to which it has been so removed.

(6) (a) The holder of an exclusive prospecting licence who has contravened or failed to comply with the provisions of subsection (1)(c), (3) or (5) shall be guilty of an offence and on conviction liable to a fine not exceeding R20 000 or to imprisonment for a period not exceeding two years or to both such fine and such imprisonment.

(b) If in any prosecution in terms of paragraph (a) of this subsection for the contravention or failure to comply with the provisions of subsection (1)(c)(iii), it is proved -

(i) that the holder referred to in that paragraph has removed any mineral or group of minerals from the prospecting area to which the exclusive prospecting licence relates;

(ii) that such holder has not obtained the permission of the Commissioner for the removal of such mineral or group of minerals as required by subsection (1)(c); and

(iii) that such holder has failed to inform the Commissioner of the removal of such mineral or group of minerals as provided in subsection (5),

it shall be presumed until the contrary is proved that such holder has removed such mineral or group of minerals for purposes of sale or disposal, as the case may be.

68. Applications for exclusive prospecting licences.

An application by any person for an exclusive prospecting licence

(a) shall contain -

- (i) in the case of a natural person, the full names, nationality, date of birth, postal and residential address of such person;
- (ii) in the case of a company, the name of such company and particulars of its incorporation and registration as a company, the registered address and principal place of business of the company in Namibia, the full names and nationality of the directors of the company, the share capital of the company and the full names and nationality of any person who is the beneficial owner of more than five per cent of the shares issued by such company; or

(iii) in the case of any person represented by an accredited agent, the full names and address of such accredited agent;

(b) shall state the period for which such exclusive prospecting licence is required and the mineral or group of minerals to which such application relates;

(c) shall be accompanied by a detailed plan of the area to which the application relates drawn according to scale of such area which shall not exceed 100 000 hectares in extent indicating

(i) its location with reference to magisterial districts;

(ii) the name and number of any farm situated therein; and

(iii) the extent of such area defined by reference to identifiable physical features or co-ordinate reference points;

- (d) shall contain a concise geological description of the area of land and, in the case of an application by a person who is the holder of a reconnaissance licence in respect of the area to which the application relates, the report or separate reports referred to in section 66(1)(d);
- (e) shall contain particulars of –
- (i) any licence, including any mining claim, issued in terms of this Act or any law repealed by this Act held by such person alone or jointly with any other person and, in the case of the holder of a reconnaissance licence by virtue of which an exclusive right is conferred in section 59(2) in the area to which the application relates, the mineral or group of minerals to which such exclusive right relates; and
 - (ii) any prospecting operations and mining operations carried on by such person alone or jointly with any other person outside Namibia,

on the date of such application and during a period of 10 years immediately preceding such date;
- (f) shall contain particulars of -
- (i) the condition of, and any existing damage to, the environment in the area to which the application relates; and
 - (ii) an estimate of the effect which the proposed prospecting operations may have on the environment and the proposed steps to be taken in order to prevent or minimize any such effect;
- (g) shall contain particulars, substantiated by documentary proof or such other proof as may be required by the Commissioner, of the technical and financial resources of, or available to, such person to carry on the prospecting operations to which the application relates;

- (h) shall contain particulars of the programme of such prospecting operations, the estimated expenditure in respect thereof, the period within which such operations will be carried on and such expenditure will be expended;
- (i) shall be accompanied by such documents as the Minister may require in relation to any particulars referred to in this section; and
- (j) may contain any other matter which in the opinion of the person concerned is relevant to the application.

69. Exercise of powers by Minister to grant or refuse exclusive prospecting licences.

(1) Subject to the provisions of this section, the Minister-

- (a) shall, in the case of an application for an exclusive prospecting licence by the holder of a reconnaissance licence to whom an exclusive right has been conferred in terms of section 59, subject to the provisions of sections 48(4) and (5) and 49, grant such application if such application relates to an area of land and a mineral or group of minerals to which such exclusive right relates; or
- (b) may, in the case of any other application for an exclusive prospecting licence, subject to the provisions of sections 48(4) and (5) and 4, grant or refuse such application.

(2) Notwithstanding the provisions of subsection (1), the Minister shall not grant an application by any person for an exclusive prospecting licence-

- (a) unless such person is a person referred to in section 46;
- (b) if, at the time of the application, such person is contravening any provision of this Act or any condition, direction or order determined, given or made under any such provision or is failing to comply with any such provision, condition, direction or order;
- (c) unless the Minister is on reasonable grounds satisfied-

- (i) with the proposed programme of prospecting operations or the proposed expenditure to be expended in respect of such operations;
 - (ii) that the person concerned has the technical and financial resources to carry on such prospecting operations;
- (d) in respect of an area of land in relation to a mineral or group of minerals in respect of which an exclusive right has, in terms of section 59, been conferred on any holder of a reconnaissance licence;
- (e) in respect of any claim area or mining area;
- (f) in respect of any area of land to which an exclusive prospecting licence or a mineral deposit retention licence relates in relation to a mineral or group of minerals to which such exclusive prospecting licence or such mineral deposit retention licence relates;
- (g) in respect of any prospecting area or retention area in relation to a mineral or group of minerals other than the mineral or group of minerals to which the exclusive prospecting licence or mineral deposit retention licence issued in respect of such areas relates, respectively, unless -
- (i) such person has given notice in writing, not later than on the date on which such application is made, to the holder of the exclusive prospecting licence or mineral deposit retention licence to which such prospecting area or retention area, as the case may be, relates of his or her application or intended application, as the case may be, for such exclusive prospecting licence and has provided the Minister of proof in writing of having done so;
 - (ii) the Minister has afforded the holder referred to in subparagraph (i) a reasonable opportunity to make representations in relation to such application;

- (iii) the Minister deems it, with due regard to representations made in terms of subparagraph (ii), if any, desirable in the interests of the development of the mineral resources of Namibia, to grant such licence; and
- (iv) the Minister is on reasonable grounds satisfied that prospecting operations carried on by virtue of such licence will not detrimentally affect the rights of any holder of an exclusive prospecting licence or a mineral deposit retention licence, as the case may be, in respect of any such area.

70. Issue of exclusive prospecting licences.

(1) Subject to subsections (4) and (5) of section 48, the Minister shall, upon the granting of an application for an exclusive prospecting licence, direct the Commissioner to issue to the person who applied for such licence, an exclusive prospecting licence on such terms and conditions as may be agreed upon as provided in the said subsections.

(2) The provisions of section 62 shall apply *mutatis mutandis* in relation to an exclusive prospecting licence.

71. Duration of exclusive prospecting licences.

(1) Subject to the provisions of this Act, an exclusive prospecting licence shall be valid -

- (a) for such period, not exceeding three years, as may be determined by the Minister at the time of the granting of such licence; and
- (b) for such further periods, not exceeding two years at a time as may be determined by the Minister at the time of the renewal of such licence as from the date on which such licence would have expired if an application for its renewal had not been made.

(2) An exclusive prospecting licence shall not be renewed on more than two occasions, unless the Minister deems it desirable in the interests of the development of the mineral resources of Namibia that an exclusive prospecting licence be renewed in any particular case on a third or subsequent occasion.

(3) Notwithstanding the provisions of subsection (1), but subject to the other provisions of this Act -

- (a) an exclusive prospecting licence shall not expire during a period during which an application for the renewal of such licence is being considered, until such application is refused or the application is withdrawn or has lapsed, whichever occurs first or, if such application is granted, until such time as the exclusive prospecting licence is renewed in consequence of such application; or
- (b) where an application is made by the holder of an exclusive prospecting licence for a mineral deposit retention licence or a mining licence in relation to an area of land which forms part of the prospecting area and in respect of any mineral or group of minerals to which such exclusive prospecting licence relates, such exclusive prospecting licence shall not expire in relation to such area of land and such mineral or group of minerals, until such application is refused or the application is withdrawn or has lapsed, whichever occurs first or, if such application is granted, until such time as the mineral deposit retention licence is issued in consequence of such application.

72. Applications for renewal of exclusive prospecting licences.

(1) Subject to the provisions of subsection (2) of this section, the provisions of section 68 shall apply *mutatis mutandis* in relation to an application for the renewal of an exclusive prospecting licence.

- (2) An application for the renewal of an exclusive prospecting licence shall -
 - (a) be made not later than 90 days before the date on which such licence will expire if it is not renewed or such later date, but not later than such expiry date, as the Minister may on good cause shown allow;
 - (b) not be made -
 - (i) in the case of a first application for the renewal of such licence, in respect of any land greater in extent than 75 per cent of the prospecting area in respect of which such licence has been issued; or

- (ii) in the case of any other application for the renewal of such licence, in respect of any land greater in extent than 50 per cent of the prospecting area citing at the date of such application,

without the approval of the Minister, granted in the interest of the development of the mineral resources of Namibia and on good cause shown by the holder of the exclusive prospecting licence in question; and

- (c) be accompanied by a report in duplicate containing the particulars contemplated in section 76(1)(e) prepared in respect of the immediately preceding period of the currency of such exclusive prospecting licence.

(3) Subject to the provisions of subsection (1), the Minister shall not grant an application for the renewal of an exclusive prospecting licence, unless the Minister is on reasonable grounds satisfied with the manner in which the programme of prospecting operations have been carried on or the expenditure expended in respect of such operation,

(4) The Minister shall not refuse to grant an application for the renewal of an exclusive prospecting licence -

(a) if the holder of such licence -

- (i) has complied with all the terms and conditions of such licence;
- (ii) has complied with the proposed programme of prospecting operations; and
- (iii) has expended the expenditure in respect of such operations as in accordance with the terms of such mineral agreement;

(b) if the Minister is on reasonable grounds satisfied -

- (i) with the proposed programme of prospecting operations or the proposed expenditure to be expended in respect of such operations;

- (ii) that the person concerned has the technical and financial resources to carry on such prospecting operations;
- (c) on the grounds thereof that such holder has contravened or failed to comply with any provision of this Act or any term and condition of such licence, unless the Minister has by notice in writing informed such holder of his or her intention to so refuse such application -
 - (i) setting out particulars of the contravention or failure in question; and
 - (ii) requiring such holder to make representations to the Minister in relation to such contravention or failure or to remedy such contravention or failure on or before a date specified in such notice,and such holder has failed to so remedy such contravention or failure or make representations.

73. Applications for amendment of exclusive prospecting licences.

(1) Subject to the provisions of subsection (2), the holder of an exclusive prospecting licence may apply for the amendment of such licence

- (a) by the extension or reduction or the extension and reduction of the prospecting area to which such licence relates; or
- (b) by the addition of any mineral or group of minerals to which such licence relates.

(2) The provisions of sections 68 and 69 shall apply *mutatis mutandis* in relation to an application referred to in subsection (1).

(3) If the Minister grants an application referred to in subsection (1) the Commissioner shall amend the licence in question accordingly.

74. Obligations of holders of exclusive prospecting licences.

The provisions of section 41(1) shall apply *mutatis mutandis* in relation to the holder of an exclusive prospecting licence, and in such application-

- (a) any reference to the registration of a mining claim, shall be construed as a reference to an exclusive prospecting licence;
- (b) any reference to mining operations, shall be deemed to have been deleted;
- (c) any reference to a claim area or a mining claim, shall be construed as a reference to a prospecting area; and
- (d) the provisions of paragraphs (b) and (c) of section 41(1) shall be deemed to have been deleted.

75. Work programmes of prospecting operations.

The provisions of section 42 shall apply *mutatis mutandis* in relation to the holder of an exclusive prospecting licence, and in such application-

- (a) any reference to the holder of a mining claim, shall be construed as a reference to the holder of an exclusive prospecting licence;
- (b) any reference to mining operations, shall be deemed to have been deleted; and
- (c) any reference to the registration of a mining claim, shall be construed as a reference to an exclusive prospecting licence.

76. Records, maps, plans and financial statements to be kept, and information, reports and returns to be submitted, by holders of exclusive prospecting licences.

- (1) The holder of an exclusive prospecting licence—
 - (a) shall keep at an address in Namibia a proper record in such form as may be determined in writing by the Commissioner in relation to—
 - (i) the location and results of all photogeological studies, imaging, geological mapping, geochemical sampling, geophysical surveying, drilling, pitting and trenching, sampling and bulk sampling carried on by such holder in the course of the prospecting operations carried on by him or her in the prospecting area to which such exclusive prospecting licence relates;

- (ii) the results of all analytical, metallurgical and mineralogical work incidental to such prospecting operations;
 - (iii) the interpretation and assessment of the studies, surveys and work referred to in subparagraphs (i) and (ii);
 - (iv) the persons employed by such holder for purposes of such prospecting operations, including the names, addresses, nationality and ages of, and total remuneration and other benefits paid and granted to such persons;
- the
- (v) the nature, mass or volume and value of any mineral or group of minerals sold or otherwise disposed of and the full names and address of any person to whom such mineral or group of minerals was sold or otherwise disposed of;
 - (vi) the expenses incurred by such holder in the course of such prospecting operations; and
 - (vii) such other work as may be determined in writing by the Commissioner and specified by notice in writing addressed and delivered to such holder;
- (b) shall prepare or cause to be prepared and maintain at all times plans and maps in respect of the prospecting area;
 - (c) shall prepare, in respect of each year of assessment, as defined in section 1 of the Income Tax Act, 1981 (Act 24 of 1981) of such holder during the currency of such exclusive prospecting licence and each period during which such exclusive prospecting licence is renewed, a statement of income and expenditure derived or incurred in connection with any prospecting operations in such prospecting area and such other financial statement, defined in section 1 of the Income Tax form as the Commissioner may determine;

- (d) shall submit within 30 days after the end of each quarter during the currency of such exclusive prospecting licence to the Commissioner in such form as may be determined in writing by the Commissioner a return or returns containing in relation to such quarter -
- (i) a summary of the particulars and information contained in the records referred to in paragraph (a) as may be required by the Commissioner and indicated in such form or requested by the Commissioner by notice in writing addressed and delivered to such holder; and
 - (ii) such other particulars as the Commissioner may require in relation to the prospecting operations carried on by such holder; and
- (e) shall submit, within 60 days after the end of the currency of such exclusive prospecting licence and of each period during which such exclusive prospecting licence has been renewed in respect of the whole of the prospecting area, or together with an application for the renewal of such exclusive prospecting licence or an application for a mineral deposit retention licence or mining licence in respect of the whole or any portion of the prospecting area, to the Commissioner -
- (i) in such form as may be determined in writing by the Commissioner, a report in duplicate or, in the case where an application is made for a mineral deposit retention licence or mining licence in respect of a portion of the prospecting area, separate reports in duplicate in respect of such portion and the remainder of such prospecting area containing in relation to such period -
 - (aa) an evaluation of the prospects of the discovery of any mineral or group of minerals in such prospecting area;

- (bb) all information, including photographs, tabulations, tapes and discs, but excluding information contained in a report furnished in terms of section 53(2), in the records referred to in paragraph (a) and the plans and maps referred to in paragraph (b);
 - (cc) the nature, mass or volume and value of any mineral or group of minerals sold or otherwise disposed of and the full names and address of any person to whom such mineral or group of minerals has been sold or otherwise disposed of;
 - (dd) an estimate of the mineral reserves in the prospecting area properly illustrated by way of plans and maps according to an appropriate scale; and
 - (ee) such other particulars as the Commissioner may require in relation to the prospecting operations carried on by such holder; and
- (ii) the statement of income and expenditure and financial statements referred to in paragraph (c).

(2) In the event of the cancellation of an exclusive prospecting licence under section 55 or the expiration of an exclusive prospecting licence, the person who was the holder of such licence immediately before such cancellation or expiration shall on a date not later than one month after the date of such cancellation or expiration deliver to the Commissioner -

- (a) all records kept in terms of the provisions of subsection (1)(a);
- (b) all maps and plans referred to in subsection (1)(b);
- (c) all reports, photographs, tabulations, tapes and discs prepared by or on behalf of such person in the course of such prospecting operations and

- (d) such other books, documents, records and reports as the Commissioner may require by notice in writing addressed and delivered to such person,

or copies of such records, maps, plans, reports, photographs, tabulations, tapes, discs, books and documents, unless a mineral deposit retention licence or a mining licence is issued to such person in relation to the area to which such exclusive prospecting licence related with effect from the date following on the date of such cancellation or lapsing or such later date as the Commissioner may on good cause shown allow.

(3) If the holder referred to in subsection (2) fails to comply with the provisions of that subsection the Commissioner may *mutatis mutandis* in accordance with the provisions of Chapter 2 of the Criminal Procedure Act, 1977 (Act 51 of 1977) -

- (a) enter upon any premises whatsoever and search for the records, maps and plans, reports, photographs, tabulations, tapes, discs, books and documents referred to in paragraphs (a) to (d) of subsection (2);
- (b) seize any such records, maps and plans, reports, photographs, tabulations, tapes, discs, books and documents,

as if he or she were a police official referred to in that Act and such records, maps and plans, reports, photographs, tabulations, tapes, discs, books and documents were concerned in the commission of any offence.

(4) Any person referred to in subsection (1) or (2) who contravenes or fails to comply with the provisions of that subsection shall be guilty of an offence and on conviction be liable to a fine not exceeding R8 000 or to imprisonment for a period not exceeding 12 months or to both such fine and such imprisonment.

PART XI

Provisions relating to mineral deposit retention licences

77. Rights of holders of mineral deposit retention licences.

(1) Subject to the provisions of subsection (2) and the other provisions of this Act, the holder of a mineral deposit retention licence shall be entitled-

- (a) to retain the retention area to which such mineral deposit retention licence relates for future mining operations;
- (b) to carry on, in order to determine from time to time the prospects of mining any mineral or group of minerals to which such mineral deposit retention licence relates on a profitable basis, prospecting operations in such retention area;
- (c) to remove any mineral or group of minerals other than a controlled mineral or sample of such mineral or group of minerals, for any purpose other than sale or disposal, from any place where it was found or incidentally won in the course of prospecting operations referred to in paragraph (b) to any other place within Namibia;
- (d) with the permission in writing of the Commissioner previously obtained generally or in every particular case and subject to such conditions as may be determined by the Commissioner or subject to the conditions of an exemption granted under section 137 -
 - (i) to remove any mineral or group of minerals referred to in paragraph (c) for any purpose other than sale or disposal, from any, where it was found or incidentally won in course of prospecting operations referred to in paragraph (b) to any place outside Namibia;
 - (ii) to remove any controlled mineral or sample of such mineral, for any purpose other than sale or disposal, from any place where it was found or incidentally won in the course of prospecting operations referred to in paragraph

- (b) to any place, whether within or outside Namibia;
 - (iii) To remove any mineral or group of minerals, for purposes of sale or disposal, from any place where it was found or incidentally won in the course of such prospecting operations;
 - (iv) to sell or otherwise dispose of any such mineral or group of minerals;
 - (c) to carry on, in order to determine from time to time the prospects of mining any mineral or group of minerals to which such licence relates on a profitable basis, such other investigations and operations, including the erection or construction of accessory works, in such retention area as may be reasonably necessary for, or in connection with, any future mining operations or any prospecting operations contemplated in paragraph (b).
- (2) The provisions of subsection (1) shall not be construed as -
- (a) conferring on the holder of a mineral deposit retention licence any preferential right to any other licence in relation to any mineral or group of minerals, other than a mineral or group of minerals to which such mineral deposit retention licence relates, during the currency or on expiry of such mineral deposit retention licence;
 - (b) preventing the Minister from granting to any other person in respect of the retention area to which such mineral deposit retention licence relates -
 - (i) a reconnaissance licence in respect of any mineral or group of minerals;
 - (ii) a reconnaissance licence by virtue of which an exclusive right is conferred upon the holder of such licence to carry on reconnaissance operations in respect of any mineral or group of minerals other than the mineral or group of minerals to which such mineral deposit retention licence relates;

- (iii) an exclusive prospecting licence, mining licence or mineral deposit retention licence in respect of any mineral or group of minerals other than the mineral or group of minerals to which such mineral deposit retention licence relates.
- (3) (a) The holder of a mineral deposit retention licence shall not erect or construct any accessory works referred to in subsection (1)(c) without the prior permission in writing of the Commissioner.
- (b) The Commissioner shall not grant the permission referred to in paragraph (a) in respect of accessory works to be erected or constructed on private land, unless the holder of such mineral deposit retention licence has complied with the provisions of section 52(1)(a) in relation to any compensation to be paid to the owner of such private land.
- (4) An application for the permission referred to in subsection (1)(d) or (3) shall be made to the Commissioner in such form as may be determined in writing by the Commissioner and shall be accompanied by such application fee, if any, as may be determined under section 123, together with such documents and information as may be required by the Commissioner.
- (5) The holder of a mineral deposit retention licence who has removed, as contemplated in paragraph (c) of subsection (1), any mineral or group of minerals other than a controlled mineral or any sample of such mineral or group of minerals from the place where it was found or incidentally won, for any purpose other than for sale or disposal, to any place within Namibia, shall, except to the extent to which such holder has been exempted, under the provisions of section 137, from the provisions of this subsection, inform the Commissioner in writing of such removal, not later than 14 days or such longer period as the Commissioner may allow after such removal, and provide particulars of the nature of such sample, mineral or group of minerals and the place to which it has been so removed.
- (6) (a) The holder of a mineral deposit retention licence who has contravened or failed to comply with the provisions of subsection (1)(d), (3) or (5) shall be guilty of an offence and on conviction be liable to a fine not exceeding R20 000 or to imprisonment for a period not exceeding two years or to both such fine and such imprisonment.

- (b) If in any prosecution in terms of paragraph (a) of this subsection for the contravention or failure to comply with the provisions of subsection (1)(d)(iii), it is proved -
- (i) that the holder referred to in that paragraph has removed any mineral or group of minerals from the retention area to which the mineral deposit retention licence relates;
 - (ii) that such holder has not obtained the permission of the Commissioner for the removal of such mineral or group of minerals as required by subsection (1)(d); and
 - (iii) that such holder has failed to inform the Commissioner of the removal of such mineral or group of minerals as provided in subsection (5),

it shall be presumed until the contrary is proved that such holder has removed such mineral or group of minerals for purposes of sale or disposal, as the case may be.

78. Persons who may apply for mineral deposit retention licences.

Notwithstanding the provisions of section 46, no person shall apply for a mineral deposit retention licence, unless such person is the holder of an exclusive prospecting licence or a mining claim in relation to the area of land and the mineral or group of minerals to which his or her application relates.

79. Applications for mineral deposit retention licences.

An application by any person for a mineral deposit retention licence-

- (a) shall contain -
- (i) in the case of a natural person, the full names, nationality, date of birth, postal and residential address of such person;
 - (ii) in the case of a company, the name of such company and particulars of its incorporation and registration as a company, the registered address and principal place of business of the company in Namibia, the full names and nationality of the directors of the company, the share capital of the company

- and the full names and nationality of any person who is the beneficial owner of more than five per cent of the shares issued by such company; and
- (iii) in the case of any person represented by an accredited agent, the full names and address of such accredited agent;
- (b) shall state the period for which such mineral deposit retention licence is required;
- (c) shall be accompanied by a detailed plan of the area to which the application relates drawn according to an appropriate scale of such area, indicating-
- (i) its location with reference to magisterial districts;
- (ii) the name and number of any farm situated therein; and
- (iii) the extent of such area defined by reference to identifiable physical features or co-ordinate reference points;
- (d) shall contain a detailed geological description of the area of land to which the application relates -
- (i) in which the mineral or group of minerals to which such application relates is set out;
- (ii) which includes an estimate, substantiated by documentary proof or such other proof as may be required by the Commissioner, of the mineral reserves in such retention area and properly illustrated by way of plans and maps drawn according to an appropriate seal; and
- (iii) which, in the case of an application made consequent upon prospecting operations carried on in lieu of mining operations on a mining claim or prospecting operations carried on in terms of an exclusive prospecting licence of which the person applying for the mineral deposit retention licence is

the holder, the report and the separate reports, if any, referred to in section 76(1)(e)(i);

(e) shall contain particulars of -

- (i) any licence, including any mining claim, issued in terms of the provisions of this Act held by such person alone or jointly with any other person and the mineral or group of minerals to which any such licence or mining claim relates; and
- (ii) any prospecting operations and mining operations carried on by such person alone or jointly with any other person outside Namibia,

on the date of such application and during a period of 10 years immediately preceding such date;

(f) shall contain particulars of -

- (i) the condition of, and any existing damage to, the environment in the area to which the application relates; and
- (ii) an estimate of the effect which the proposed prospecting operations may have on the environment and the proposed steps to be taken in order to minimize or prevent any such effect;

(g) shall contain particulars, substantiated by documentary proof or such other proof as may be required by the Commissioner, of the technical and financial resources of, or available to, such person;

(h) shall be accompanied by a statement containing

- (i) the reasons why any deposit of any mineral or group of minerals contained in the area of land to which the application relates cannot at the time of the application be won or mined on a profitable basis;

- (ii) an indication of the circumstances in which, and the earliest date on which, such mineral or group of minerals can be won or mined on a profitable basis; and
- (iii) the reasons why no further prospecting operations can usefully be carried on in such prospecting area or on such mining claim or the portion thereof to which the application relates;
- (i) shall be accompanied by such other documents and information as the Minister may require in relation to such application; and
- (j) may contain any other matter which in the opinion of the person concerned is relevant to the application.

80. Exercise of powers of Minister to grant or refuse mineral deposit retention licences.

(1) The Minister shall not grant an application for a mineral deposit retention licence to a person who is, in terms of section 78, entitled to apply for such licence-

- (a) in respect of an area larger than an area which in the opinion of the Minister would be required, having regard to the available minerals or groups of minerals in the area to which the application relates, to carry on the proposed future mining operations;
- (b) if at the time of the application, such person is contravening any provision of this Act or any condition, direction or order determined, given or made under any such provision or is failing to comply with any such provision, condition, direction or order;
- (c) in relation to any mineral or group of minerals, unless the Minister is on reasonable grounds satisfied-
 - (i) that the deposit of the mineral or group of minerals in the area to which the application relates cannot, for the reasons set out in the application, be won or mined on a profitable basis at the time and can probably be so won or mined on the expiration of the period contemplated in section 82;

- (ii) that no further prospecting operations can usefully be carried on in the area to which the application relates; and
 - (iii) that it is desirable, having regard to the future utilization of the mineral resources of Namibia, to grant such licence;
- (d) in relation to the area of land to which such application relates in respect of any mineral or group of minerals, if at the time of such application -
- (i) such area of land forms part of any prospecting area in relation to any mineral or group of minerals other than the mineral or group of minerals to which the exclusive prospecting licence issued in respect of that area relates, unless -
 - (aa) such person has given notice in writing, not later than on the date on which such application is made, to the holder of the exclusive prospecting licence to which such prospecting area relates of his or her application or intended application, as the case may be, for such mineral deposit retention licence;
 - (bb) the Minister has afforded the holder referred to in item (aa) a reasonable opportunity to make representations in relation to such application;
 - (cc) the Minister deems it, with due regard to any representations made in terms of item (bb), desirable, having regard to the future utilization of the mineral resources of Namibia, to grant such licence;
 - (dd) the Minister is on reasonable grounds satisfied that prospecting operations referred to in paragraph (b) of section 77(1) and any other investigations and operations referred to in paragraph (e) of that section to be carried on by virtue of such licence will not detrimentally affect the rights of any holder of an

exclusive prospecting licence in respect of any such area and that the prospecting operations carried on by the holder of the exclusive prospecting licence on that portion of the prospecting area to which the application relates have little or no prospects of success of discovering any mineral or group of minerals which may in the opinion of the Minister be won or mined on a profitable basis;

(ii) such area Of land forms part of any retention area in relation to any mineral or group of minerals other than the mineral or group of minerals to which the mineral deposit retention licence issued in respect of that area relates, unless -

(aa) the Minister deems it desirable, having regard to the future utilization of the mineral resources of Namibia, to grant such licence;

(bb) the Minister is on reasonable grounds satisfied that prospecting operations referred to in paragraph (b) of section 77(1) and any other investigations and operations referred to in paragraph (e) of that section to be carried on by virtue of such licence will not detrimentally affect the rights of any holder of the mineral deposit retention licence in respect of any such area;

(cc) the holder of the mineral deposit retention licence has consented to the mineral deposit retention licence being granted.

(2) The Minister shall not refuse to grant an application for a mineral deposit retention licence on any grounds contemplated in subsection (1)(b), unless the Minister -

(a) has by notice in writing informed such holder of his or her intention to so refuse such application -

(i) setting out particulars of the grounds on which his or her intention is based; and

- (ii) requiring such holder to make representations to the Minister in relation to such grounds or to remedy any matter relating to such grounds specified in such notice, and such holder has failed to so remedy such matter or to make representations; and
- (b) has taken into consideration any representations made by such person.

81. Issue of mineral deposit retention licences.

(1) Subject to subsections (4) and (5) of section 48, the Minister shall, upon the granting of an application for a mineral deposit retention licence, direct the Commissioner to issue to the person who applied for such licence, a mineral deposit retention licence on such terms and conditions as may be agreed upon as provided in the said subsections.

(2) The provisions of section 62 shall apply *mutatis mutandis* in relation to a mineral deposit retention licence.

82. Duration of mineral deposit retention licences.

(1) Subject to the provisions of this Act, a mineral deposit retention licence shall be valid -

- (a) for such period, not exceeding five years, as may be determined by the Minister at the time of the granting of such licence; and
- (b) for such further period, not exceeding two years, as may from time to time be determined by the Minister at the time of the granting of any application for the renewal of such licence.

(2) Notwithstanding the provisions of subsection (1), but subject to the other provisions of this Act

- (a) a mineral deposit retention licence shall not expire during a period during which an application for the renewal of such licence is being considered until such application is refused or the application is withdrawn or has lapsed, whichever occurs first or, if such application is granted, until such time as the exclusive prospecting licence is renewed in consequence of such application;

- (b) where an application is made by the holder of a mineral deposit retention licence for a mining licence in relation to an area of land which forms part of the retention area and in respect of any mineral or group of minerals to which such mineral deposit retention licence relates, such mineral deposit retention licence shall not expire in relation to such area of land and such mineral or group of minerals, until such application is refused or the application is withdrawn or has lapsed, whichever occurs first or, if such application is granted, until such time as the exclusive prospecting licence is renewed in consequence of such application.

83. Effect of issue of mineral deposit retention licences on prospecting areas.

When a mineral deposit retention licence is issued-

- (a) to the holder of a mining claim in respect of the claim area to which that mining claim relates, the registration of such mining claim shall, for purposes of the provisions of Part VII, be deemed to have lapsed; or
- (b) to the holder of an exclusive prospecting licence in respect of an area of land which forms part of the prospecting area and any mineral or group of minerals to which such exclusive prospecting licence relates –
- (i) such exclusive prospecting licence shall cease to have effect in relation to such area of land as from the date on which such mineral deposit retention licence is issued;
- (ii) any other exclusive prospecting licence shall so cease to have effect, unless the Minister has, subject to the provisions of section 80(1)(d)(i), determined otherwise on such conditions as may be determined in writing by him or her.

84. Applications for renewal of mineral deposit retention licences.

(1) Subject to the provisions of subsection (2) of this section, the provisions of sections 79 and 80 shall apply *mutatis mutandis* in relation to an application for the renewal of a mineral deposit retention licence.

(2) An application for the renewal of a mineral deposit retention licence shall be made not later than 90 days before the date on which such licence will expire if it is not renewed or such later date, but not later than such expiry date, as the Minister may on good cause shown allow.

(3) Subject to the provisions of subsection (1), the Minister shall not refuse an application for the renewal of a mineral deposit retention licence on the grounds thereof that the holder of such licence has contravened or failed to comply with any provision of this Act or any term and condition of such licence, unless the Minister has by notice in writing informed such holder of his or her intention to so refuse such application-

- (a) setting out particulars of the contravention or failure in question; and
- (b) requiring such holder to make representations to the Minister in relation to such contravention or failure or to remedy such contravention or failure on or before a date specified in such notice,

and such holder has failed to so remedy such contravention or failure or make representations.

85. Application for amendment of mineral deposit retention licence.

The provisions of section 73(1) shall apply *mutatis mutandis* in relation to the amendment of a mineral deposit retention licence, and in such application-

- (a) any reference to an exclusive prospecting licence, shall be construed as a reference to a mineral deposit retention licence;
- (b) any reference to a prospecting area, shall be construed as a reference to a retention area; and
- (c) any reference to sections 68 and 69 shall be deemed to be a reference to sections 79 and 80.

86. Obligations of holders of mineral deposit retention licences.

The provisions of section 41(1) shall apply *mutatis mutandis* in relation to the holder of a mineral deposit retention licence, and in such application-

- (a) any reference to the registration of a mining claim, shall be construed as a reference to a mineral deposit retention licence;

- (b) any reference to mining operations shall be construed as a reference to work performed by virtue of a mineral deposit retention licence;
- (c) any reference to a claim area or a mining claim, shall be construed as a reference to a retention area; and
- (d) the provisions of paragraph(c) of section 41(1) shall be deemed to have been deleted.

87. Work programmes of operations carried on in terms of mineral deposit retention licence.

The provisions of section 42 shall apply *mutatis mutandis* in relation to the holder of a mineral deposit retention licence, and in such application-

- (a) any reference to the holder of a mining claim, shall be construed as a reference to the holder of a mineral deposit retention licence;
- (b) any reference to mining operations, shall be construed as a reference to work performed by virtue of a mineral deposit retention licence; and
- (c) any reference to the registration of a mining claim, shall be construed as a reference to a mineral deposit retention licence.

88. Directions by Minister to holders of mineral deposit retention licences to apply for mining licences.

(1) Subject to the provisions of subsection (2), the Minister may, if he or she has reason to believe -

- (a) that any mineral or group of minerals to which a mineral deposit retention licence relates may be won or mined, sold or otherwise disposed of on a profitable basis;
- (b) that further prospecting operations may indicate the existence of any such mineral or group of minerals which may be won or mined, sold or otherwise disposed of on a profitable basis,

by notice in writing addressed and delivered to the holder of such licence, require such holder -

- (i) to apply for a mining licence to carry on mining operations in respect of such mineral or group of minerals;

(ii) to carry on such further prospecting operations as may be specified in such notice in relation to such retention area within such reasonable period as may be specified in such notice; or

(iii) to abandon, if he or she so desires, such retention area in accordance with the provisions of section 54.

(2) The Minister shall not issue a notice under subsection (1) to the holder of a mineral deposit retention licence, unless the Minister-

(a) has by notice in writing addressed and delivered to such holder informed such holder of his or her intention to issue a notice contemplated in that subsection-

(i) setting out the reasons for such intention; and

(ii) requiring such holder to make within such period as may be specified in such notice representations to the Minister in relation to such reasons; and

(b) has taken into consideration any representations made by such person.

(3) Any holder of a mineral deposit retention licence who contravenes or fails to comply with a notice referred to in subsection (1) shall be guilty of an offence and on conviction be liable to a fine not exceeding R50 000 or to imprisonment for a period not exceeding two years or to both such fine and such imprisonment.

89. Records, maps, plans and financial statements to be kept, and information, reports and returns to be submitted, by holders of mineral deposit retention licences.

(1) The holder of a mineral deposit retention licence-

(a) shall keep at an address in Namibia a proper record in such form as may be determined in writing by the Commissioner in relation to-

(i) the investigations and operations, including the erection or construction of accessory works in such retention area as may be reasonably necessary carried on by such

holder for, or in connection with, future mining operations contemplated in section 77;

- (ii) the location and results of all photogeological studies, imaging, geological mapping, geochemical sampling, geophysical surveying, drilling, pitting and trenching, sampling and bulk sampling carried on by such holder in the course of the prospecting operations carried on by him or her in the retention area to which such mineral deposit retention licence relates;
 - (iii) the results of all analytical, metallurgical and mineralogical work incidental to such prospecting operations;
 - (iv) the interpretation and assessment of the studies, surveys and work referred to in subparagraphs (ii) and (iii);
 - (v) the persons employed by such holder for purposes of such investigations and operations, including the names, addresses, nationality and ages of, and remuneration and other benefits paid and granted to such persons;
 - (vi) the nature, mass or volume and value of any mineral or group of minerals sold or otherwise disposed of and the full names and address of any person to whom such mineral or group of minerals was sold or otherwise disposed of;
 - (vii) the expenses incurred by such holder in the course of such prospecting operations; and
 - (viii) such other work as may be determined by the Commissioner and specified by notice in writing addressed and delivered to such holder;
- (b) shall prepare or cause to be prepared and maintain at all times plans and maps in respect of the retention area;

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- (c) shall prepare, in respect of each year of assessment, as defined in section 1 of the Income Tax Act, 1981 (Act 24 of 1981), of such holder during the currency of such mineral deposit retention licence W each period during which such mineral deposit retention licence is renewed, a statement of income and expenditure derived or incurred in connection with any operations in such retention area and such other financial statements as the Commissioner may require in such form as the Commissioner may determine;
- (d) shall submit, within 60 days after the end of the currency of such mineral deposit retention licence in respect of the whole of the retention area, or together with an application for the renewal of such mineral deposit retention licence or an application for a mining licence in respect of the whole or any portion of the retention area, to the Commissioner-
- (i) in such form as may be determined in writing by the Commissioner, a report in duplicate or, in the case where an application is made for a mining licence in respect of a portion of the retention area, separate reports in duplicate in respect of such portion and the remainder of such retention area, setting out in relation to such period -
- (aa) an evaluation of the prospects of future mining operations in such retention area;
- (bb) all information, including photographs, tabulations, tapes and discs, in the records referred to in paragraph (a) and the plans and maps referred to in paragraph (b);
- (cc) such other particulars as the Commissioner may require in relation to the operations carried on by such holder;
- (ii) the statement of income and expenditure and financial statements referred to in paragraph (c);

- (e) shall submit within 90 days after the end of each year during the currency of such retention licence to the Commissioner in such form as may be determined in writing by the Commissioner the statement of income and expenditure and financial statements referred to in paragraph (c); and
- (f) shall submit to the Minister such other reports, records and other information as the Minister may from time to time require in connection with the carrying on of investigations and operations in the retention area in question.

(2) In the event of the cancellation of a mineral deposit retention licence under section 55 or the expiration of a mineral deposit retention licence the person who was the holder of such licence immediately before such cancellation or expiration shall on a date not later than 180 days after the date of such cancellation or expiration deliver to the Commissioner -

- (a) all records kept in terms of the provisions of subsection (1)(a) and
- (b) such other books, documents, records and reports as the Commissioner may require by notice in writing addressed and delivered to such person,

or copies of such records, books, documents and reports, unless a mining licence is issued to such person in relation to the area to which such mineral deposit retention licence related with effect from the date following on the date of such cancellation or lapsing or such later date as the Commissioner may on good cause shown allow.

(3) If the holder referred to in subsection (2) fails to comply with the provisions of that subsection the Commissioner may *mutatis mutandis* in accordance with the provisions of Chapter 2 of the Criminal Procedure Act, 1977 (Act 51 of 1977) -

- (a) enter upon any premises whatsoever and search for the records, maps and plans, reports, photographs, tabulations, tapes, discs, books and documents referred to in paragraphs (a) and (b) of subsection (2);

- (b) seize any such records, maps and plans, reports, photographs, tabulations, tapes, discs, books and documents,

as if he or she were a police official referred to in that Act and such records, maps and plans, reports, photographs, tabulations, tapes, discs, books and documents were concerned in the commission of any offence.

(4) Any person referred to in subsection (1) or (2) who contravenes or fails to comply with the provisions of that subsection shall be guilty of an offence and on conviction be liable to a fine not exceeding R8 000 or to imprisonment for a period not exceeding 12 months or to both such fine and such imprisonment.

PART XII

Provisions relating to mining licences

90. Rights of holders of mining licences.

(1) Subject to the provisions of subsection (2) and the other provisions of this Act, the holder of a mining licence shall be entitled-

- (a) to carry on mining operations in the mining area to which such licence relates for such mineral or group of minerals as may be specified in such licence;
- (b) to carry on in such mining area, in conjunction with any mining operations referred to in paragraph (a), any prospecting operations in relation to any mineral or group of minerals;
- (c) to remove any mineral or group of minerals other than a controlled mineral or sample of such mineral or group of minerals, for any purpose other than sale or disposal, from any place where it was found or won or mined in the course of mining operations referred to in paragraph (a) or found or incidentally won in the course of prospecting operations referred to in paragraph (b) to any other place within Namibia;

- (d) with the permission in writing of the Commissioner previously obtained generally or in every particular case and subject to such conditions as may be determined by the Commissioner or subject to the conditions of an exemption granted under section 137 -
- (i) to remove any mineral or group of minerals referred to in paragraph (c) for any purpose other than sale or disposal, from any place where it was won or mined in the course of mining operations referred to in paragraph (a) or found or incidentally won in the course of prospecting operations referred to in paragraph (b) to any place outside Namibia;
 - (ii) to remove from the mining area, for any, purpose other than sale or disposal, any controlled mineral or sample of such mineral won or mined in the course of mining operations referred to in paragraph (a) or found or incidentally won in the course of prospecting operations referred to in paragraph (c) to any place, whether within or outside Namibia;
 - (iii) to remove from the mining area, for purposes of sale or disposal, any mineral or group of minerals won or mined in the course of mining operations referred to in paragraph (a) or found or incidentally won in the course of prospecting operations referred to in paragraph (b);
 - (iv) to sell or otherwise dispose of any such mineral or group of minerals;
 - (e) to carry on such other operations, including the erection or construction of accessory works as may be reasonably necessary for, or in connection with, the mining operations, removal, selling or disposal or prospecting operations contemplated in paragraph (a), (b), (c) or (d).
- (2) (a) The holder of a mining licence shall not erect or construct any accessory works referred to in subsection (1)(e) without the prior permission in writing of the Commissioner.

(b) The Commissioner shall not grant the permission referred to in paragraph (a) in respect of accessory worksto be erected or constructed on private land, unless the holder of the mining licence has complied *mutatis mutandis* with the provisions of section 52(1)(a) in relation to any compensation to be paidto the owner of such private land.

(3) An application for the permission referred to in subsections (1)(d) and (2) shall be made to the Commissioner in such form as my be determined in writing by the Commissioner and shall be accompanied by such appidation fee, if any, as may be determined under section 123, together with such documents and information as may be required by the Commissioner.

(4) The holder of a mining licence who has removed, as contemplated in paragraph (c) of subsection (1), any mineral or group of minerals other than a controlled mineral or any sample of such mineral or group of minerals from the place where it was found, won or mined, for any purpose other than for sale or disposal, to any place within Namibia, shall, except to the extent to which such holder has been exempted, under the provisions of section 137, from the provisions of this subsection, inform the Commissioner in writing of such removal, not later than 14 days or such longer period as the Commissioner may allow after such removal, and provide particulars of the nature of such sample, mineral or group of minerals and the place to which it has been so removed.

(5) (a) The holder of a mining licence who has contravened or failed to comply with provisions of subsection (1)(d) or (4) shall be guilty of an offence and on conviction be liable to a fine not exceeding R20 000 or to imprisonment for a period not exceeding two years or to both such fine and such imprisonment.

(b) If in any prosecution in terms of paragraph (a) of this subsection for the contravention or failure to comply with the provisions of subsection (1)(d)(iii), it is proved -

(i) that the holder referred to in that paragraph has removed any mineral or group of minerals from the mining area to which the mining licence relates;

(ii) that such holder has not obtained the permission of the Commissioner for the removal of such mineral or group of minerals as required by subsection (1)(d); and

(iii) that such holder has failed to inform the Commissioner of the removal of such mineral or group of minerals as provided in subsection (4),

it shall be presumed until the contrary is proved that such holder has removed such mineral or group of minerals for purposes of sale or disposal.

91. Applications for mining licences.

An application by any person for a mining licence

(a) shall contain -

(i) in the case of a natural person, the full names, nationality, date of birth, postal and residential address of such person;

(ii) in the case of a company, the name of such company and particulars of its incorporation and registration as a company, the registered address and principal place of business of the company in Namibia, the full names and nationality of the directors of the company, the share capital of the company and the full names and nationality of any person who is the beneficial owner of more than five per cent of the shares issued by such company; or

(iii) in the case of any person represented by an accredited agent, the full names and address of such accredited agent;

(b) shall state the period for which such mining licence is required;

(c) shall be accompanied by a detailed plan of the area to which the application relates drawn according to scale of such area indicating-

- (i) its location with reference to magisterial districts;
 - (ii) the name and number of any farm situated therein; and
 - (iii) the extent of such area defined by reference to identifiable physical features or co-ordinate reference points;
- (d) shall contain a detailed geological description of the area of land to which the application relates -
- (i) in which the mineral or group of minerals to which such application relates is set out;
 - (ii) which includes an estimate, substantiated by documentary proof or such other proof as may be required by the Commissioner, of the mineral reserves in such mining area and properly illustrated by way of plans and maps drawn according to scale; and
 - (iii) which, in the case of an application made consequent upon prospecting operations or mining operations carried on in terms of an exclusive prospecting licence, mineral deposit retention licence or on a mining claim of which the person applying for the mining licence was the holder, the report and the separate report, if any, referred to in section 45(1)(f)(i), 76(1)(e)(i) or 89(1)(d)(i), as the case may be;
- (e) shall contain particulars of -
- (i) any licence, including any mining claim, held, whether alone or jointly with any other person, and the mineral or group of minerals to which such licence or mining claim relates; and
 - (ii) any prospecting operations and mining operations carried on by such person alone or jointly with any other person outside Namibia,

on the date of such application and during a period of 10 years immediately preceding such date;

- (f) shall contain particulars of -
 - (i) the condition of, and any existing damage to, the environment in the area to which the application relates;
 - (ii) an estimate of the effect which the proposed prospecting operations and mining operations may have on the environment and the proposed steps to be taken in order to minimize or prevent any such effect; and
 - (iii) the manner in which it is intended to prevent pollution, to deal with any waste, to safe guard the mineral resources, to reclaim and rehabilitate land disturbed by way of the prospecting operation and mining operations and to minimize the effect of such operations on land adjoining the mining area;
- (g) shall be accompanied by a complete technical report on the proposed development, mining and ore treatment activities, including-
 - (i) the dates of commencement of development, mining and ore treatment activities;
 - (ii) the capacity of production and scale of operations; and
 - (iii) the overall mining of ore and minerals or groups of minerals and the nature thereof;
- (h) shall contain particulars, substantiated by documentary proof or such other proof as may be required by the Commissioner, of the technical and financial resources of, or available to, such person to carry on the prospecting operations to which the application relates;

- (i) shall contain particulars of the programme of such mining operations, the estimated expenditure in respect thereof, the period within which such operations will be carried on and such expenditure will be made;
- (j) shall be accompanied by a detailed forecast of capital investment, operating cost, income and profits and particulars of the means of financing;
- (k) shall be accompanied by such documents as the Minister may require in relation to any particulars referred to in this section; and
- (l) may contain any other matter which in the opinion of the person concerned is relevant to the application.

92. Exercise of powers of Minister to grant or refuse mining licences.

(1) The Minister -

(a) shall in the case of an application for a mining licence by-

- (i) the holder of a reconnaissance licence to whom an exclusive right has been conferred in terms of section 59;
- (ii) the holder of an exclusive prospecting licence;
- (iii) the holder of a mineral deposit retention licence; or
- (iv) the holder of a mining claim,

subject to the provisions of subsections (2) and (4) of this section, grant such application, if such application relates to an area of land and a mineral or group of minerals to which such exclusive right or mineral deposit retention licence or the claim area in question relates;

(b) may, in the case of any other application for a mining licence, subject to the provisions of subsections (3) and (4) of this section, grant or refuse such application.

(2) Notwithstanding the provisions of subsection (1)(a), the Minister shall not grant an application by any person for a mining licence

- (a) in respect of an area larger than an area which in the opinion of the Minister would be required, having regard to the available minerals or groups of minerals in the area to which the application relates, to carry on such mining operations;
- (b) if, at the time of the application, such person is contravening any provision of this Act or any condition, direction or order determined, given or made under any such provision or is failing to comply with any such provision, condition, direction or order;
- (c) unless the Minister is on reasonable grounds satisfied-
 - (i) that the area of land to which the application relates contains a mineral or group of minerals to which the application relates which in the opinion of the Minister may be won or mined, sold or otherwise disposed of on a profitable basis;
 - (ii) that the proposed programme of mining operations to be carried out and the expenditure to be expended in respect of such operations will ensure
 - (aa) efficient, beneficial and timely use of the mineral or group of minerals to which the application relates;
 - (bb) adequate protection of the environment;
 - (iii) that the person concerned has the technical and financial resources to carry on such mining operations;
- (d) in respect of an area of land in relation to a mineral or group of minerals in respect of which an exclusive right has, in terms of section 59, been conferred on any holder of a reconnaissance licence;

- (e) in respect of any claim area or mining area;
- (f) in respect of any area of land to which an exclusive prospecting licence or a mineral deposit retention licence relates in relation to a mineral or group of minerals to which such exclusive prospecting licence or such mineral deposit retention licence relates;
- (g) in respect of any prospecting area in relation to any mineral group of minerals other than the mineral or group of minerals to which the exclusive prospecting licence issued in respect of that area relates, unless-
 - (i) such person has given notice in writing, not later than on the date on which such application is made, to the holder of the exclusive prospecting licence to which such prospecting area relates of his or her application or intended application, as the case may be, for such mining licence and has provided the Minister of proof in writing of having done so;
 - (ii) the Minister has afforded the holder referred to in subparagraph (i) a reasonable opportunity to make representations in relation to such application;
 - (iii) the Minister deems it, with due regard to any representations made in terms of subparagraph (ii), if any, desirable in the interests of the development of the mineral resources of Namibia, to grant such licence; and
 - (iv) the Minister is on reasonable grounds satisfied-
 - (aa) that mining operations carried on by virtue of such licence will not detrimentally affect the rights of any holder of an exclusive prospecting licence in respect of any such area;

- (bb) that the prospecting operations carried on by the holder of the exclusive prospecting licence on that portion of the prospecting area to which the application relates have little or no prospects of success of discovering any mineral or group of minerals which may in the opinion of the Minister be won or mined on a profitable basis;
- (h) in respect of any retention area in relation to any mineral or group of minerals other than the mineral or group of minerals to which the mineral deposit retention licence issued in respect of that area relates, unless-
 - (i) the holder of the mineral deposit retention licence has consented in writing to the mining licence being granted; and
 - (ii) the Minister deems it desirable in the interests of the development of the mineral resources of Namibia to grant such licence.
- (3) The Minister shall not grant an application referred to in subsection (1)(b), if at the time of the application –
 - (a) the area of land to which the application relates forms part of a mining area or a claim area;
 - (b) the area of land to which the application relates forms part of the area to which a reconnaissance licence by virtue of which an exclusive right has been conferred in terms of section 59, an exclusive prospecting licence or a mineral deposit retention licence relates, unless -
 - (i) the holder of such licence has consented to such mining licence being granted; and
 - (ii) the Minister deems it desirable in the interests of the development of the mineral resources of Namibia to grant such mining licence;

(c) the person applying for such mining licence is contravening any provision of this Act or any condition, direction or order determined, given or made under any such provision or is failing to comply with any such provision, condition, direction or order.

(4) The Minister shall not, in the case of an application contemplated in subsection (1)(a), refuse to grant such application on any grounds contemplated in subsection (2)(b) or (c) or, in the case of an application referred to in subsection (1)(b), refuse to grant such application on any grounds contemplated in subsection (3)(c), unless the Minister

(a) has by notice in writing informed such holder of his or her intention to so refuse such application -

(i) setting out particulars of the grounds on which his or her intention is based; and

(ii) requiring such holder to make representations to the Minister in relation to such grounds or to remedy any matter relating to such grounds specified in such notice, and such holder has failed to so remedy such matter or to make representations; and (b) has taken into consideration any representations made by such person.

93. Issue of mining licences.

(1) Subject to subsections (4) and (5) of section 48, the Minister shall, upon the granting of an application for a mining licence, direct the Commissioner to issue to the person who applied for such licence, a mining licence on such terms and conditions as may be agreed upon as provided in the said subsections.

(2) The provisions of section 62 shall apply *mutatis mutandis* in relation to a mining licence.

94. Duration of mining licences.

(1) Subject to the provisions of this Act, a mining licence shall be valid-

(a) for a period of 25 years or such shorter period which in the opinion of the Minister represents the estimated life of the mine and determined by the Minister at the time of the granting of the mining licence; or

- (b) for such further periods, not exceeding 15 years at a time, which in the opinion of the Minister represents the remaining period of the estimated life of the mine and determined by the Minister at the time of the renewal of such licence, as from the date on which such licence would have expired if an application for its renewal had not been made or on the date on which the application for such renewal is granted, whichever date is the later date.

(2) Notwithstanding the provisions of subsection(1), but subject to the other provisions of this Act, a mining licence shall not expire until such application for renewal of the licence is refused or the application is withdrawn or has lapsed, whichever occurs first or, if such application is granted, until such time as the mining licence is renewed in consequence of such application.

95. Effect of issue of mining licences on prospecting areas.

When a mining licence is issued-

- (a) to the holder of a mining claim in respect of the claim area to which that mining claim relates, the registration of such mining claim shall, for purposes of the provisions of Part VII, be deemed to have lapsed; or
- (b) to the holder of an exclusive prospecting licence in respect of an area of land which forms part of the prospecting area and any mineral or group of minerals to which such exclusive prospecting licence relates -
- (i) such exclusive prospecting licence shall cease to have effect in relation to such area of land as from the date on which such mining licence is issued;
- (ii) any other exclusive prospecting licence shall so cease to have effect, unless the Minister has, with the concurrence of such holder to whom such mining licence is issued and subject to the provisions of section 92(2)(g), determined otherwise on such conditions as may be determined in writing by the Minister; or

- (c) to the holder of a mineral deposit retention licence in respect of an area of land which forms part of the retention area and any mineral or group of minerals to which such mineral deposit retention licence relates-
- (i) such mineral deposit retention licence shall cease to have effect in relation to such area of land as from the date on which such mining licence is issued;
 - (ii) any other mineral deposit retention licence shall so cease to have effect, unless the Minister has, with the concurrence of such holder to whom such mining licence is issued and subject to the provisions of section 92(2)(h), determined otherwise on such conditions as may be determined in writing by the Minister.

96. Applications for renewal of mining licences.

(1) Subject to the provisions of subsection (2) of this section, the provisions of section 91 shall apply *mutatis mutandis* in relation to an application for the renewal of a mining licence.

(2) An application for the renewal of a mining licence shall be made not later than 12 months before the date on which such licence will expire if it is not renewed or such later date, but not later than such expiry date, as the Minister may on good cause shown allow.

(3) Subject to the provisions of subsection (1), the Minister shall not grant an application for the renewal of a mining licence -

- (a) unless the holder of such licence proves to the satisfaction of the Minister that the mineral or group of minerals to which such licence relates still exists in the mining area in such quantity that it can still be won or mined and sold or otherwise disposed of on a profitable basis;
- (b) unless the Minister is on reasonable grounds satisfied with the proposed mining operations and expenditure to be carried out or expended during the renewal period.

(4) The Minister shall not refuse to grant an application for the renewal of a mining licence -

(a) if the holder of such licence has complied with-

(i) the terms and conditions of such licence;

(ii) the proposed programme of mining operations,

and has expended in respect of such operations the amount required to be expended in terms of such terms and conditions;

(b) if the Minister is on reasonable grounds satisfied -

(i) with the proposed programme of mining operations or the proposed expenditure to be expended in respect of such operations;

(ii) that the person concerned has the technical and financial resources to carry on such mining operations;

(c) on the grounds thereof that such holder has contravened or failed to comply with any provision of this Act or any term and condition of such licence, unless the Minister has by notice in writing informed such holder of his or her intention to so refuse such application -

(i) setting out particulars of the contravention or failure in question;

(ii) requiring such holder to make representations to the Minister in relation to such contravention or failure or to remedy such contravention or failure on or before a date specified in such notice,

and such holder has failed to so remedy such contravention or failed to make representations.

97. Applications for amendment of mining licences.

The provisions of section 73(1) shall apply *mutatis mutandis* in relation to the amendment of a mining licence, and in such application-

- (a) any reference to an exclusive prospecting licence, shall be construed as a reference to a mining licence;
- (b) any reference to prospecting operations, shall be construed as a reference to mining operations; and
- (c) any reference to sections 68 and 69, shall be deemed to be a reference to sections 91 and 92.

98. Obligations of holders of mining licences.

The provisions of section 41(1) shall apply *mutatis mutandis* in relation to the holder of a mining licence, and in such application-

- (a) any reference to the registration of a mining claim, shall be construed as a reference to a mining licence;
- (b) any reference to a claim area or a mining claim, shall be construed as a reference to a mining area; and
- (c) the provisions of paragraph (c) of section 41(1) shall be deemed to have been deleted.

99. Notice of cessation of mining operations.

(1) The holder of a mining licence shall –

- (a) before he or she intends to cease permanently or temporarily or to reduce the rate of his or her mining operations give notice of his or her intentions to the Minister on a date not later than-
 - (i) in the case of an intended permanent cessation of mining operations, six months;
 - (ii) in the case of an intended temporary cessation of such mining operations, 30 days; or
 - (iii) in the case of an intended reduction of such mining operations, seven days, or such other period as the Minister may on good cause shown allow before such intended permanent or temporary cessation or intended reduction;

(b) if he or she for any reason beyond his or her control at any time permanently or temporarily ceases or reduces his or her mining operations, notify the Minister of such permanent or temporary cessation or reduction as soon as possible after such cessation or reduction, and provide reasons for such intentions or cessation or reduction, as the case may be, and such particulars as the Minister may require in connection with the location, nature and extent of such mining operations.

(2) On receipt of a notice referred to in subsection (1), or if the Minister has otherwise reason to believe that the holder of any mining licence has ceased or reduced, whether permanently or temporarily, mining operations, the Minister may

(a) cause the matter to be investigated;

(b) with due regard to any representations made by such holder, take such steps *mutatis mutandis* in accordance with provisions of section 55 or 100 as the Minister may deem necessary or expedient in the interests of the mineral resources of Namibia.

100. Directions by Minister in relation to mining of minerals or groups of minerals by holder of mining licences.

(1) Subject to the provisions of subsection (2), the Minister may—

(a) if any mineral or group of minerals to which a mining licence relates is not won or mined in the mining area to which such licence relates and the Minister is on reasonable grounds satisfied that such mineral or group of minerals is capable of being won or mined in that area on a profitable basis;

(b) if the Minister is, having regard to good mining practices, the technical and financial resources of such holder and the prevailing marketability of any such mineral or group of minerals, on reasonable grounds satisfied that any mineral or group of minerals is not won or mined at an optimal rate or in a manner calculated to effect such optimal rate, from time to time by notice in writing addressed and delivered to the holder of such mining licence, direct such holder -

- (i) to take, within such reasonable period as may be specified in such notice and with due regard to good mining practices, such steps as may be necessary and practicable to mine any mineral or group of minerals in such mining area and so specified;
- (ii) to increase or reduce, within such reasonable period as may be specified in such notice, the rate at which such mineral or group of minerals is won or mined in such area to such rate, not exceeding, in the case of an increase, the capacity of the mining facilities of the holder of the licence, as the Minister may specify in such notice; or
- (iii) to abandon, if he or she so desires, such mining area in accordance with the provisions of section 54.

(2) The Minister shall not give a direction under subsection (1) to the holder of a mining licence, unless the Minister-

- (a) has by notice in writing addressed and delivered to such holder informed such holder of his or her intention to give a direction contemplated in that subsection –
 - (i) setting out the reasons for such intention;
 - (ii) requiring such holder to make within such period as may be specified in such notice representations to the Minister in relation to such reasons;
- (b) has taken into consideration any representations made by such person.

(3) Any holder of a mining licence who contravenes or fails to comply with a notice referred to in subsection (1) shall be guilty of an offence and on conviction be liable to a fine not exceeding R50 000 or to imprisonment for a period not exceeding two years or to both such fine and such imprisonment.

101. Records, maps, plans and financial statements to be kept, and information, reports and returns to be submitted, by holders of mining licences.

(1) The holder of a mining licence –

(a) shall keep at an address in Namibia a proper record in such form as may be determined in writing by the Commissioner in relation to -

(i) any mining operations referred to in section 90(1)(a)-

(aa) the nature, appraisal and results of all mining operations carried on in the mining area to which such mining licence relates;

(bb) the nature and mass or volume of any mineral or group of minerals won or mined in such mining area and treated or stockpiled in such mining area or elsewhere;

(cc) the nature, mass or volume and value of any mineral or group of minerals so won or mined, sold or otherwise disposed of and the full names and address of any person to whom such mineral or group of minerals was sold or otherwise disposed of;

(dd) the nature and mass or volume of any waste removed from such mining area and the manner in which it was disposed of;

(ee) the persons employed by such holder for purposes of such mining operations, including the names, addresses, nationality and ages of, and remuneration and other benefits paid and granted to such persons;

(ff) the unit operating and off-mine costs incurred;

(gg) the expenses incurred by such holder in the course of such mining operations; and

- (hh) such other work carried on in the course of such mining operations as may be determined by the Commissioner and specified by notice in writing addressed and delivered to such holder;
- (ii) any prospecting operations referred to in section 90(1)(b)-
- (aa) the nature, location and results of all photogeological studies, imaging, geological mapping, geochemical sampling, geophysical surveying, drilling, pitting and trenching, sampling and bulk sampling carried on by such holder in the course of such prospecting operations;
- (bb) the results of all analytical, metallurgical and mineralogical work incidental to such prospecting operations;
- (cc) the interpretation and assessment of the studies, surveys and work referred to in items (aa) and (bb);
- (dd) the nature and mass or volume of any mineral or group of minerals found or incidentally won in the course of such prospecting operations;
- (ee) the persons employed by such holder for purposes of such prospecting operations, including the names, addresses, nationality and ages of, and remuneration and other benefits paid and granted to such persons;
- (ff) the expenses incurred by such holder in the course of such prospecting operations; and
- (gg) such other work performed in the course of such mining operations as may be determined by the Commissioner and specified by notice in writing addressed and delivered to such holder;

- (b) shall prepare or cause to be prepared and maintain at all times plans and maps in respect of the mining area;
- (c) shall prepare, in respect of each year of assessment, as defined in section 1 of the Income Tax Act 1981 (Act 24 of 1981), of such holder during the currency of such mining licence, a statement of income and expenditure derived or incurred in connection with such mining operations, including a balance sheet and profit and loss account, and such other financial statements as the Commissioner may require in such form as the Commissioner may determine;
- (d) submit within 15 days after the end of each month to the Commissioner in such form as may be determined in writing by the Commissioner a return or returns containing in relation to such month-
 - (i) such summary of the particulars and information contained in the records referred to in paragraph (a)(i) as may be required by the Commissioner and indicated in such form or requested by the Commissioner by notice in writing addressed and delivered to such holder; and
 - (ii) such other particulars as the Commissioner may require in relation to the mining operations and prospecting operations carried on by such holder in such mining area;
- (e) shall submit within 60 days after 31 December in each year to the Commissioner -
 - (i) in such form as may be determined in writing by the Commissioner, a return or returns containing in relation to such year-
 - (aa) a summary of the particulars and information contained in the records referred to in paragraph (a)(i) as may be required by the Commissioner and indicated in such form or requested by the Commissioner by notice in writing addressed and delivered to such holder;

- (bb) an estimate of the remaining mineral reserves in such mining area properly illustrated by way of plans and maps according to an appropriate scale;
 - (cc) particulars of any proposed mining operations and prospecting operations during the succeeding year, together with a forecast of the source of such mining operations in terms of delineated mineral reserves; and
 - (dd) such other particulars as the Commissioner may require in relation to the mining operations and prospecting operations carried on by such holder in such mining area;
- (ii) the statement of income and expenditure and financial statements referred to in paragraph (c);
- (f) submit, within 60 days after the end of every second year as from the granting of such mining licence -
- (i) in such form as may be determined in writing by the Commissioner, a report in duplicate containing in respect of prospecting operations carried on in conjunction with its mining operations during such period-
 - (aa) all information, including photographs, tabulations, tapes and discs, in the records referred to in paragraph (a)(ii) and the plans and maps referred to in paragraph (b); and
 - (bb) such other particulars as the Commissioner may require in relation to the prospecting operations carried on by such holder;
 - (ii) the statement of income and expenditure and financial statements referred to in paragraph (c); and

- (g) submit to the Minister such other reports, records and other information as the Minister may from time to time require in connection with the carrying on of mining operations in the mining area in question.

(2) In the event of the cancellation of a mining licence under section 55 or the expiration of a mining licence the person who was the holder of such licence immediately before such cancellation or expiration shall on a date not later than 180 days after the date of such cancellation or expiration deliver to the Commissioner -

- (a) all records kept in terms of the provisions of subsection (1)(a);
- (b) all maps and plans referred to in subsection (1)(b);
- (c) all reports, photographs, tabulations, tapes and discs prepared by or on behalf of such person in the course of such prospecting operations; and
- (d) such other books, documents, records and reports as the Commissioner may require by notice in writing addressed and delivered to such person,

or copies of such records, maps, plans, reports, photographs, tabulations, tapes, discs, books and documents.

(3) If the holder referred to in subsection (2) fails to comply with the provisions of that subsection the Commissioner may *mutatis mutandis* in accordance with the provisions of Chapter 2 of the Criminal Procedure Act, 1977 (Act 51 of 1977) -

- (a) enter upon any premises whatsoever and search for the records, maps and plans, reports, photographs, tabulations, tapes, discs, books and documents referred to in paragraphs (a) to (d) of subsection (2);
- (b) seize any such records, maps, and plans, reports, photographs, tabulations, tapes, discs, books and documents,

as if he or she were a police official referred to in that Act and such records, maps and plans, reports, photographs, tabulations, tapes, discs, books and documents were concerned in the commission of any offence.

(4) Any person referred to in subsection (1) or (2) who contravenes or fails to comply with the provisions of any such subsection shall be guilty of an offence and on conviction be liable to a fine not exceeding R8 000 or to imprisonment for a period not exceeding 12 months or to both such fine and such imprisonment.

PART XIII

Provisions relating to source material specified in Part 5 of Schedule 1

102. Possession, disposal, enrichment, reprocessing and export of source material specified in Part 5 of Schedule 1.

(1) Except with the permission in writing of the Minister and subject to such conditions as may be so determined by the Minister a person shall—

- (a) be in possession of any source material specified in Part 5 of Schedule 1, unless he or she -
 - (i) has come into possession of such source material as a result of prospecting operations or mining operations lawfully carried on by him or her;
 - (ii) is in possession of such source material on behalf of and authorized in writing by a person who-
 - (aa) has so come into possession of such source material;
 - (bb) has lawfully acquired such source material or is in possession of such source material on behalf of a person who has lawfully acquired such source material;
- (b) dispose of any source material specified in Part 5 of Schedule 1;

- (c) enrich or reprocess any such source material;
- (d) import any such source material into, or export such source material from, Namibia.

(2) No person shall buy or otherwise receive from any other person any source material specified in Part 5 of Schedule 1, except upon production to him or her of the permission in writing referred to in subsection (1).

(3) Any person who wishes to obtain the permission referred to in subsection (1) shall apply in such form as may be determined in writing by the Minister for such permission, and shall submit together with such application such documents and other information as may be required by the Minister.

(4) For purposes of this section "enrich" shall mean to increase the ratio of an isotopic constituent of an element to the remaining isotopic constituents of that element relative to the naturally occurring ratio.

103. Offences and penalties.

Any person who contravenes or fails to comply with the provisions of subsection (1) or (2) of section 102 or contravenes or fails to comply with any conditions of any permission in writing referred to in the said subsection (1), shall be guilty of an offence and on conviction liable to a fine not exceeding R50 000 or to imprisonment for a period not exceeding two years or to both such fine and such imprisonment.

PART XIV High value minerals

104. Prohibitions relating to dealing in or possession of high value minerals.

- (1) Subject to the provisions of this section and any other law, no person
 - (a) shall purchase, sell, deal in, receive or dispose of by way of barter, pledge or otherwise, either as principal or as agent or have in his or her possession, any high value mineral, unless -
 - (i) such person is -

- (aa) in the case of a person who has won or mined such high value mineral on a mining claim registered in his or her name in respect of such high value mineral or in terms of a mining licence issued in respect of such high value mineral, granted the permission contemplated in section 31(1)(d) or 90(1)(d), as the case may be; or
- (bb) in the case of a person who is in possession of such high value mineral on a claim area or mining area on which such high value mineral has been won or mined, is so in possession on the claim area so registered or on the mining area in respect of which such mining licence has been so issued;
- (ii) such person is, in the case of a person who has found or incidentally won such high value mineral in terms of a non-exclusive prospecting licence, an exclusive prospecting licence or a mineral deposit retention licence issued in respect of such high value mineral, granted the permission contemplated in section 16(1)(c), 67(1)(c) or 77(1)(d), as the case may be;
- (iii) such person is in possession of a permit issued in terms of section 105 authorizing such person to purchase, sell, deal in, receive or dispose of, or to be in possession of such high value mineral;
- (iv) such person is in possession of an authorization in writing issued by a person referred to in subparagraph (i), (ii) or (iii) authorizing him or her to purchase, sell, deal in, receive or dispose of, or to be in possession of, such high value mineral on behalf of such person in the course of his or her duties as his or her agent or servant;
- (v) in the case of an unwrought precious metal, such unwrought precious metal does not exceed 10 gramme in mass; or

- (vi) such person has come into possession of such high value mineral in a lawful manner;
- (b) shall purchase or otherwise receive any high value mineral from any other person without having satisfied himself or herself that such person is lawfully entitled to sell or otherwise dispose of, or to be in possession of, such high value mineral;
- (c) shall deliver or cause to be delivered any high value mineral in payment of any debt due from him or her or any other person or in consideration of any service rendered or to be rendered to him or her or any other person.
- (2) Any person who contravenes or fails to comply with the provisions of subsection (1) shall be guilty of an offence and on conviction be liable-
- (a) in the case of an offence referred to in paragraph (a) or (b) of subsection (1), to a fine not exceeding R50 000 or to imprisonment for a period not exceeding three years or to both such fine and such imprisonment; or
- (b) in the case of an offence referred to in paragraph (c) of subsection (1), to a fine not exceeding R20 000 or to imprisonment for a period not exceeding two years or to both such fine and such imprisonment.

105. Applications for, and issue of, permits.

(1) An application for a permit referred to in section 104(1)(a)(iii) shall be made to the Commissioner in such form as may be determined in writing by the Commissioner and shall be accompanied by such application fee, if any, as may be determined under section 123.

(2) An application referred to in subsection (1) shall not be granted, except after consultation with the Inspector-General of the Namibian Police Force or a person designated by him or her.

(3) The Commissioner shall, upon the granting of an application referred to in subsection (1) and the payment of such fee, if any, as may be determined under section 123, issue in such form as may be determined in writing by him or her a permit for such period, not exceeding 12 months, as may be so determined by the Commissioner at the time

of the granting of such application authorizing the holder thereof to purchase, sell, deal in, receive or dispose of, or to be in possession of, such high value mineral.

106. Obligations of persons authorized under section 105 to purchase, sell, deal in, receive or dispose of, or to be in possession of, high value minerals.

(1) Any holder of a permit issued under section 105 who purchases or otherwise receives for purposes of sale or disposal any high value mineral shall keep a register in such form as may be determined in writing by the Commissioner in which shall be recorded in relation to any transaction by virtue of which any such high value mineral is so purchased or received within 24 hours after every such transaction-

- (a) the date and time of such transaction;
 - (b) the nature of such transaction;
 - (c) the full names and address of the persons involved in such transaction;
 - (d) the nature and weight of the high value mineral so purchased or received;
 - (e) the price, if any, involved in such transaction;
 - (f) the number and date of the permit issued under section 105 and by virtue of which the high value mineral was sold or otherwise disposed of; and
 - (g) the manner in which such holder has dealt with any high value mineral.
- (2) A holder referred to in subsection (1) shall-
- (a) submit, within 15 days after the end of each quarter during the currency of such permit, by way of an affidavit or a solemn declaration to the Commissioner an extract in duplicate of the register referred to in subsection (1) containing the record of all transactions which have taken place during each month of such quarter;
 - (b) shall, upon the request of the Commissioner or any police officer, produce such register for inspection.

(3) Any holder referred to in subsection (1) who contravenes or fails to comply with the provisions of subsection (1) or (2) shall be guilty of an offence and on conviction be liable to a fine not exceeding R50 000 or to imprisonment for a period not exceeding two years or to both such fine and such imprisonment and the court convicting any such holder shall declare the permit issued to such holder to be forfeited.

PART XV

Ancillary rights

107. Limitation of fundamental rights contemplated in Article 16 of Constitution.

The provisions of this Part, in so far as they provide for a limitation on the fundamental rights contemplated in subarticle (1) of Article 16 of the Namibian Constitution in order to authorize, subject to an obligation to pay just compensation, the holder of a non-exclusive prospecting licence, a mineral licence or a mining claim to enter upon any land of any person for purposes of carrying on operations authorized by such licence, are enacted upon the authority conferred by subarticle (2) of that Article.

108. Establishment of Minerals Ancillary Rights Commission

(1) There is hereby established a commission to be known as the Minerals Ancillary Rights Commission which shall consist of a chairperson and two other members appointed from time to time by the President.

(2) A member of the Commission shall hold office at the President's pleasure.

(3) A member of the Commission who is not in the fulltime service of the State may be paid such remuneration and allowances as may be determined in writing by the Minister with the concurrence of the Minister of Finance.

(4) (a) The Administrative and clerical work involved in the performance of the Commission's functions, shall be performed by officers in the public service made available by the Permanent Secretary for that purpose.

(b) The Commission may designate an officer referred to in paragraph (a) to be the secretary of the Commission.

(5) Any meeting of the Commission shall be held at a time and place determined by the chairperson of the Commission.

(6) Two members of the Commission shall form a quorum for a meeting of the Commission.

(7) The decision of a majority of the members of the Commission shall be a decision of the Commission: Provided that in the event of an equality of votes the chairperson shall have a casting vote in addition to his or her deliberative vote.

(8) The provisions of the Commissions Act, 1947 (Act 8 of 1947) shall apply *mutatis mutandis* in relation to the Commission as if it were a commission referred to in section 1 of that Act.

109. Obtaining of rights by holder of non-exclusive prospecting licence, mineral licence or a mining claim.

(1) When it is reasonably necessary for the holder of a non-exclusive prospecting licence, a mineral licence or a mining claim to obtain a right -

- (a) to enter upon land in order to carry on operations authorized by such licence or mining claim on such land;
- (b) to erect or construct accessory works on any land for purposes of such operations;
- (c) to obtain a supply of water or any other substance in connection with such operations;
- (d) to dispose of water or any other substance obtained during such operations;
- (e) to do anything else in order to exercise any right conferred upon him or her by such licence or mining claim,

and who is prevented from carrying on such operations by reason thereof

- (i) that the owner of the land in question or any person competent to grant such right in relation to such land refuses to grant such right or demands, in return for such right, terms and conditions which are in the circumstances unreasonable, or has raised a dispute in relation to

the interpretation or application of an order made by the Commission in terms of section 110(4);

- (ii) that, due to the number of owners or persons competent to grant such right involved or such owners or persons having conflicting interests, it is not possible to obtain any such right;
- (iii) that any such owner or person is absent from Namibia or such owner or person's whereabouts is unknown or is a minor or of unsound mind or otherwise under any disability to grant any such right,

may apply in writing to the Commission to grant any such right to him or her.

(2) An application in terms of subsection (1) shall set out by way of a statement under oath or affirmation or in such other form, if any, as may be determined in writing by the Commission particulars of the right required, the circumstances under which such right is required and the circumstances under which the holder of the non-exclusive prospecting licence, a mineral licence or mining claim is prevented from obtaining or exercising such right.

(3) The Commission shall as soon as possible after the receipt of an application referred to in subsection (2), cause -

- (a) a notice to be published in the *Gazette* and in one newspaper circulating in the area in which the land in question is situated setting out the name of the holder of the non-exclusive prospecting licence, a mineral licence or mining claim concerned, the nature of the right required and a description of the land in respect of which it is so required;
- (b) copies of such notice and application to be addressed and delivered to the owner or person competent to grant any such right, if known, calling upon such owner, person or other interested person to make representations, if he or she so wishes, in opposition to such application in such manner and within such period as may be specified in such notice.

110. Consideration of applications by Commission.

(1) The Commission shall inquire as soon as possible into any application made in terms of section 109.

(2) Any person whose interests are or may be prejudicially affected by the grant of an application referred to in subsection (1) shall be entitled to be heard either personally or by way of a legal representative, and to examine and cross-examine any person giving evidence before the Commission.

(3) The Commission, in considering whether any right to which an application relates should be granted and the terms and conditions, if any, to be imposed if such a right is granted, shall have regard to the effect of the exercise of such right on such land and the facilities thereon.

(4) (a) If the Commission is on reasonable grounds satisfied that it is reasonably necessary for the holder of the non-exclusive prospecting licence, a mineral licence or mining claim to obtain such a right in order to carry on operations authorized by such licence or mining claim the Commission shall by order in writing grant such right subject to such terms and conditions and for such period as the Commission may think fit or make such other order as it may deem necessary or expedient, whereupon such right shall, subject to the provisions of subsection (5), vest in the holder of the non-exclusive prospecting licence, a mineral licence or mining claim concerned.

(b) The chairperson of the Commission -

(i) may at any time before or after publication of the notice referred to in paragraph (a) of subsection (3) of section 109, at the request in writing of the holder of a non-exclusive prospecting licence who in terms of section 109(1) has made an application to the Commission to be granted any right referred to in that section, in writing grant to such person, subject to such terms and conditions (including terms and conditions relating to the payment of compensation or the giving of security) as may be determined by him or her, the right referred to in paragraph (a) of section 109(1), as an interim measure, until such time as the matter is considered by the Commission in accordance with the provisions of this section;

(ii) shall not grant any right under subparagraph (i), unless he or she is on reasonable grounds satisfied -

(aa) that the granting of such right ought not to be deferred until the Commission has dealt with the application; and

(bb) that the owner of the land in question or person competent to grant such right in relation to such land cannot be found timeously, or that he or she is absent from Namibia or that his or her whereabouts is unknown.

(c) Any right granted under paragraph (b)(i) shall lapse on the date on which the application made under section 109(1) is considered and decided upon by the Commission.

(5) No right granted under this section by the Commission shall confer any power or impose any obligation or liability upon the holder of a non-exclusive prospecting licence, a mineral licence or mining claim concerned other than such power, obligation or liability which would otherwise have been conferred or imposed upon him or her had such right been granted to such holder by the owner or other person concerned.

111. Costs incurred in respect of applications to Commission.

(1) The Commission shall be empowered to order any party to the proceedings to pay the costs of, any part of such costs incurred by any other party in relation to the application and proceedings filed in consequence of such application if such order were an order made by a magistrate's court.

(2) Any order made in terms of subsection (1) shall be executable as if such order were a judgement of magistrate's court.

112. Compensation payable in respect of rights granted.

(1) If any right is granted in terms of section 110 the Commission shall, if no amount of compensation is agreed upon between the holder of the non-exclusive prospecting licence, a mineral licence or mining claim concerned and the owner or other person concerned, determine an amount which in the opinion of the Commission represents just compensation for the right so granted which shall be paid by the holder concerned in respect of such right.

(2) If compensation is in terms of an order of the Commission to be paid in respect of any right granted by such order, it shall, unless the Commission determines otherwise, be a condition of such order that the compensation so payable shall be paid or that security for the payment thereof shall be given before the right is exercised.

113. Right of appeal.

(1) Any person who feels aggrieved by a decision of the Commission shall have the right to appeal to the High Court of Namibia.

(2) For purposes of an appeal referred to in subsection (1) and the procedure to be followed in connection with such appeal the decision of the Commission shall be deemed to be a judgement of a magistrate's court.

**PART XVI
Financial matters****114. Royalties payable on minerals.**

(1) The holder of a mining claim or a mining licence who has won or mined in the course of any prospecting or mining operations carried on by him or her, and the holder of any non-exclusive prospecting licence, exclusive prospecting licence or mineral deposit retention licence who has found or incidentally won in the course of any prospecting operations carried on by him or her, any mineral or group of minerals, shall be liable to pay to the Commissioner for the benefit of the State Revenue Fund a royalty -

- (a) in the case of any such holder in respect of any rough and uncut mineral of the precious stone group won or mined by such holder in the course of any prospecting operations or mining operations carried on by such holder in terms of such

- licence or on such mining claim, as the case may be, and sold or otherwise disposed of by such holder, at a rate of 10 per cent;
- (b) in the case of any such holder in respect of any rough or unprocessed mineral of the dimension stone group won or mined by such holder in the course of any prospecting operations or mining operations carried on by such holder in terms of such licence or on such mining claim, as the case may be, and sold or otherwise disposed of by such holder, at a rate of five per cent;
- (c) in the case of any such holder in respect of any other mineral or group of minerals so won or mined by such holder, levied by the Minister by notice in writing addressed and delivered to such holder in accordance with the provisions of subsection (2), at such rate, not exceeding five per cent, as may be determined by the Minister from time to time by notice in the *Gazette*, of the market value, determined as provided in subsection (3), of such mineral or group of minerals, on a date-
- (i) in the case of a holder referred to in paragraph (a), not later than the date on which the sale or disposal of such mineral or group of minerals takes place;
- (ii) in the case of a holder referred to in paragraph (b), not later than 30 days after the end of each period of six months or part of such period as from the date on which such licence is issued or such claim is registered, as the case may be;
- (iii) in the case of a holder referred to in paragraph (c), determined by the Minister and specified in the notice so referred to in relation to any mineral or group of minerals sold or disposed of during a period so determined.
- (2) (a) Subject to the provisions of paragraph (b), the Minister may, for purposes of the provisions of subsection (1)(c), levy, with due regard to any return submitted in terms of section 24, 45, 76, 89 or 101 by any holder of a licence or claim referred to in the said subsection and to any representations, if any, made by such holder in terms of

paragraph (b), by notice in writing addressed and delivered to any such holder, upon such holder a royalty in respect of any mineral or group of minerals referred to in subsection (1)(c) won or mined by such holder in the course of any prospecting operations or mining operations carried on by such holder during such period as may be determined in writing by the Minister, if the Minister is of the opinion -

- (i) that, in the case of any mineral or group of minerals which has been or is about to be exported, any such mineral or group of minerals is of such a nature that it is capable of being increased in value by way of a practical and economical process which is available in Namibia;
 - (ii) that the amount received by, or accrued to, or received in favour of, such holder in respect of the sale or disposal of such mineral or group of minerals in a sale at arm's length was not in conformity with prices which were in the opinion of the Minister paid at the time in international markets; or
 - (iii) that the amounts deducted from the amount at which such mineral or group of minerals has been sold or disposed of in respect of fees, charges or levies were not in conformity with rates which were in the opinion of the Minister charged at the time in international markets.
- (b) The Minister shall not issue a notice referred to in paragraph (a), unless the Minister -
- (i) has by notice in writing addressed and delivered to the holder concerned, informed such holder of his or her intention to levy a royalty upon such holder in respect of any mineral or group of minerals won or mined by such holder and provided the grounds on which such intention is based;
 - (ii) has afforded such holder an opportunity within such reasonable period as may be specified in such notice to make representations and, if such holder so desires, proposals

in relation to any matter relating to such intention; and

(iii) has taken into account such representations and proposals.

(3) For purpose of subsection (1), the market value of any mineral or group of minerals shall be -

- (a) determined in accordance with any term and condition, if any, of the licence of the holder concerned; or
- (b) if no such term and condition exists, determined in writing by the Minister, having regard to the value agreed between the holder in question and the person to whom such mineral or group of minerals was sold or disposed of in an arm's length sale and prices which were in the opinion of the Minister at the time paid on international markets for such mineral or group of minerals, less any amounts deducted in respect of fees, charges or levies which are in the opinion of the Minister charged on international markets.

115. Penalties for late payments.

(1) When any person has failed to pay an amount on or before the date determined by or under the provisions of section 114, an additional amount, calculated at the rate of one-third of one per cent per day, shall be payable on such amount or any part thereof as from the date on which such amount was payable until such time as such amount is paid.

(2) The provisions of paragraph (a) of section 116(1) shall apply *mutatis mutandis* in relation to an amount payable in terms of subsection (1).

116. Remission and deferment of royalties or penalties.

(1) Notwithstanding the provisions of the State Finance Act, 1991 (Act 31 of 1991), the Minister may, with the concurrence of the Minister of Finance, on application made to him or her by the holder of a licence or mining claim referred to in section 114-

- (a) by notice in writing addressed and delivered to such holder
 - (i) remit wholly or partly any royalty or penalty payable in terms of section 114 or 115;

(ii) deter payment of any such royalty or penalty;

(b) refund wholly or partly any royalty or penalty paid in terms of section 114 or 115, on such conditions as may be determined by the Minister and specified in such notice, or may refuse to so remit or refund such royalty or penalty or defer such payment.

(2) The Minister shall on or before 30 June in each year lay upon the Table of the National Assembly a report consisting of the full names of such holder in respect of whom royalties or penalties were remitted or refunded or of which payment of royalties or penalties were deferred during the financial year which ended in that year and the amounts involved and the reasons for such remission, refund or def~~erment~~.

117. Powers of Minister in case of failure by holders of licences or mining claims to pay royalties.

(1) If the holder of a licence or mining claim referred to in section 114 fails to pay any royalty payable in terms of that section by such holder ~~on~~ before the date referred to in that section or such date to which the payment of such royalty has been remitted or deferred in terms of section 116, the Minister may by notice addressed and delivered to such holder prohibit -

(a) the removal of any mineral or group of minerals from the prospecting area, mining area, retention area, claim area or other area to which the licence in question relates;

(b) any dealings in connection with any mineral or group of minerals won or mined from such prospecting area, mining area, retention area, claim area or other area, until such time as such royalty has been paid, or the payment of such royalty has been remitted or deferred in terms of section 116.

(2) Any holder of a licence or mining claim referred to in this section who contravenes or fails to comply with a notice issued under subsection (1) shall be guilty of an offence and on conviction liable to a fine not exceeding R20 000 or to imprisonment for a period not exceeding two years or to both ~~such~~ fine and such imprisonment.

118. Security for payment of royalties.

(1) The Minister may, when he or she deems it necessary to secure the payment of a royalty, by notice in writing addressed and delivered to any holder of a licence or mining claim referred to in section 114 require such holder to provide the Minister with a guarantee given by a person approved by the Minister.

(2) Any holder referred to in subsection (1) who contravenes or fails to comply with a notice issued under that subsection shall be guilty of an offence and on conviction be liable to a fine not exceeding R20 000 or to imprisonment for a period not exceeding two years or to both such fine and such imprisonment.

119. Powers of Minister relating to pricing of minerals.

(1) Subject to the provisions of subsection (2), the Minister may, if he or she has reason to suspect that any mineral or group of minerals won or mined in the course of any prospecting operations or mining operations by a holder referred to in section 114 has been sold or disposed of by such holder

- (a) at an amount which was intentionally fixed or agreed upon at an amount which is less than the price which was, in the opinion of the Minister, paid at the time on international markets;
- (b) at an amount from which was deducted an amount in respect of fees, charges or levies which was intentionally fixed or agreed upon which is more than the rates which were, in the opinion of the Minister, charged at the time on international markets, direct such holder to pay to the benefit of the State Revenue Fund an amount equal to the difference between an amount referred to in paragraph (a) or (b) and an amount which in the opinion of the Minister is in conformity with an amount determined in accordance with the prices and rates paid and charged on international markets at the time of the sale or disposal of the mineral or group of minerals in question.

(2) The Minister shall not give a direction under subsection (1), unless he or she-

- (a) has by notice in writing addressed and delivered to the holder concerned, informed such holder of his or her intention to give such direction and provided the grounds on which such intention is based;

- (b) has afforded such holder an opportunity within such reasonable period as may be specified in such notice to make representations and, if such holder so desires, proposals in relation to any matter relating to such intention; and
- (c) has taken into account such representations and proposals.

120. Proof of amounts payable in terms of this part.

In any proceedings to recover in a competent court any amount payable under any provision of this Part, a certificate purporting to be a certificate under the hand of the Minister certifying that an amount of money specified in such certificate is payable in terms of the provisions of this Part by any holder referred to in section 114 named in such certificate, shall be prima facie evidence of the facts stated in such certificate.

PART XVII
General provisions

121. Obligations of persons applying for, non-exclusive prospecting licences, registration of mining claims or mineral licences, and of holders of non-exclusive prospecting licences, mining claims or mineral licences, not resident in Namibia to appoint accredited agents.

- (1) Subject to the provisions of this Act—
 - (a) no non-exclusive prospecting licence or mineral licence shall be issued to, and no mining claim shall be registered in respect of, any natural person who is not resident in Namibia;
 - (b) no grant, cession or assignment to any such person of any interest in a mining claim or mineral licence shall be approved;
 - (c) no such person shall be joined as the joint holder of any mining claim or mineral licence or any interest in such mining claim or mineral licence,

unless such person has designated in writing a person who is so resident and who is a person to whom any such licence may be granted or in whose name any such mining claim may be registered or to whom such interest may be granted, ceded or assigned or may be so joined, as his or her accredited agent for purposes of the provisions of this Act.

(2) Any holder of a non-exclusive prospecting licence, mining claim or mineral licence or any person to whom an interest in any such licence or claim has been granted, ceded or assigned or any person joined as joint holder of any such licence or claim or any interest in such licence or claim who takes up residence outside Namibia, shall, within 30 days after having so taken up residence, designate any person who is resident in Namibia and who is a person to whom any such licence may be granted or in whose name any such mining claim may be registered or to whom such interest may be granted, ceded or assigned or may be so joined, as his or her accredited agent for purposes of the provisions of this Act.

(3) An accredited agent shall be a person who has in writing accepted his or her designation in terms of subsection (1) or (2) and who is approved in writing by the Commissioner, and such accredited agent shall, upon such approval, for purposes of the provisions of this Act, be deemed to be the holder of the licence or claim in question or to be the person to whom such interest has been granted, ceded or assigned or who has been joined as the joint holder concerned, as the case may be.

(4) The provisions of this section shall not be construed as absolving the holder of the licence or claim in question of any liability or obligations imposed upon him or her by any provision of this Act.

(5) Any person who contravenes or fails to comply with the provisions of subsection (2) shall be guilty of an offence and on conviction be liable to a fine not exceeding R8 000 or to imprisonment for a period not exceeding 12 months or to both such fine and such imprisonment.

122. Reservation of land from prospecting operations and mining operations.

(1) Subject to the provisions of this section, the Minister may at any time by notice in the *Gazette*, if he or she deems it necessary or expedient in the national interest, declare that no person other than the holder of a reconnaissance licence shall, notwithstanding anything to the contrary contained in this Act or any other law, but subject to any right conferred upon the holder of any mining claim, exclusive prospecting licence, mineral deposit retention licence or mining licence by this Act before the date of such notice and which exists on the date immediately before the date of such notice, carry on any prospecting operations or mining operations in, on or under any land or area described by the Minister in such notice.

- (2) The Minister may in any notice referred to in subsection (1) or by like notice
- (a) if he or she deems it necessary or expedient in the interests of the development of the mineral resources of Namibia or for the better exercise of control over minerals in Namibia, invite applications in respect of the whole or any part of the land or area referred to in subsection (1) for any licence in respect of any mineral or group of minerals specified in such notice for consideration on or after a date so specified;
 - (b) if he or she deems it necessary or expedient for the protection of the environment or the natural resources of Namibia or the prevention of the pollution of such environment or damage to the natural resources, declare that any prospecting operations or mining operations may be carried on in, on or under any such land or area by any holder of a non-exclusive prospecting licence, mining claim, exclusive prospecting licence, mineral deposit retention licence or mining licence only with the special permission of the Minister and subject to such terms and conditions as may be determined by the Minister.

(3) An application for the special permission referred to in subsection (2)(b) shall be made to the Minister in such form as may be determined by the Minister and shall be accompanied by such application fee, if any, as may be determined under section 123, together with such documents and information as may be required by the Minister.

(4) Any person who contravenes or fails to comply with a notice issued under subsection (1) shall be guilty of an offence and on conviction liable to a fine not exceeding R50 000 or to imprisonment for a period not exceeding three years or to both such fine and such imprisonment.

123. Determination of application, licence and registration fees payable in terms of this Act.

(1) Subject to the provisions of section 22 of the State Finance Act, 1991 (Act 31 of 1991), the Minister may from time to time determine by notice in the *Gazette* the amount of -

- (a) any fees to be paid in relation to any application for, or in connection with, a non-exclusive prospecting licence or mineral licence or for, or in connection with, the registration of any mining claim at the time of such application, or for any permit referred to in section 105;
- (b) any licence fees, claim fees or other fees to be paid by the holders of any such licence or mining claim during the currency or renewal period, if any, at such dates, for such periods and on such basis as may be determined by the Minister in such notice;
- (c) any inspection fees or other fees to be paid by any person in relation to any permit or permission required by any provision of this Act and the inspection of any register to be kept and maintained by the Commissioner or other function to be performed by him or her,

and may from time to time amend or withdraw any such notice by like notice.

(2) When an application referred to in paragraph (a) of subsection (1) is refused, three-quarters of any application fee and the full amount of any licence fee referred to in that paragraph which was paid at the time of such application shall be refunded to the person who has made such application.

(3) The provisions of section 115 shall apply *mutatis mutandis* in relation to the holder of any licence or mining claim referred to in subsection (1) who has failed to pay any licence fees or claim fees on or before the date determined under paragraph (b) of that subsection.

(4) One half of any licence fees or claim fees referred to in paragraph (b) of subsection (1) paid to the Commissioner in respect of-

- (a) any mineral licence in terms of which prospecting operations or mining operations are carried on on private land; or
- (b) any mining claim situated on private land,

shall be paid over by the Commissioner at the end of April and October in each year to the owner of such land or, in the case of such land or mining claim situated on private land which is owned by more than one owner, to such owners in such proportion as may be determined in writing by the Commissioner.

124. Notice by Commissioner of applications made in terms of this Act.

The Commissioner shall give notice of any application for a mineral licence or the registration of a mining claim received in his or her office by posting a notice on the day after the date on which such application was received in which-

- (a) it is made known for general information that such application has been received in his or her office; and
- (b) is stated -
 - (i) the name of the person who submitted such application;
 - (ii) the nature of the licence, the area and the mineral or group of minerals to which such application relates;
 - (iii) the date on which such application was received; and
 - (iv) such other particulars as may be determined in writing by the Commissioner,

and shall keep such notice so posted until such date as such application has finally been disposed of.

125. Order in which applications made in terms of this Act are to be considered.

All applications made in terms of any provision of this Act and received in the office of the Commissioner, shall be considered by the Minister or the Commissioner, as the case may be, in the same order as such applications have been so made and received: Provided that all applications so received on the same date shall be deemed to have been received simultaneously.

126. Reports to be submitted by purchasers and sellers of minerals.

- (1) Any person—
 - (a) who, whether as agent or principal, has purchased or otherwise acquired from any holder of a non-exclusive prospecting licence, a mining claim or a mineral licence, any controlled mineral;

- (b) who has sold or otherwise disposed of any controlled mineral; or
- (c) who deals, whether or not by virtue of a licence issued in terms of any law governing trading licences, in minerals or any group of minerals other than controlled minerals and who has sold any mineral or group of minerals to any person,

shall submit forthwith to the Commissioner in such form as may be determined in writing by the Commissioner a report in duplicate setting out -

- (i) the mass or volume and nature of any such mineral or group of minerals purchased or acquired and the amounts paid or other remuneration exchanged, if any, in respect of the purchase or acquisition of such mineral or group of minerals;
- (ii) the mass, volume, nature and value of any such mineral or group of minerals sold or otherwise disposed of and such particulars of the persons to whom such mineral or group of minerals has been so sold or disposed of and the places whereto such mineral or minerals have been removed.

127. Export of minerals or groups of minerals.

(1) No person shall export any mineral or group of minerals from Namibia, except with the permission of the Commissioner previously obtained generally or in every particular case in writing and subject to such conditions as may be determined by the Commissioner, unless he or she-

- (a) is the holder of a non-exclusive prospecting licence, a mining claim or a mineral licence and has been granted the permission referred to in section 16(1)(c), 31(1)(d), 67(1)(c), 77(1)(d) or 90(1)(d) to remove any such mineral or group of minerals from Namibia; or
- (b) is exempted from the provisions of this section in terms of section 137.

(2) An application for the permission referred to in subsection (1), shall be made to the Commissioner or any other person designated by him or her in such form as may be determined in writing by the Commissioner and shall be

accompanied by such application fee, if any, as may be determined under section 123, together with such documents and information as may be required by the Commissioner.

(3) Any person who has contravened or failed to comply with the provisions of subsection (1) shall be guilty of an offence and on conviction liable to a fine not exceeding R20 000 or to imprisonment for a period not exceeding two years or to both such fine and such imprisonment.

128. Removal of property from areas to which non-exclusive prospecting licences, mining claims or mineral licences relate on abandonment, cancellation or expiration, and remedying of damage caused to surface of, and environment on, land situated in such areas.

(1) If a non-exclusive prospecting licence or mineral licence or the registration of a mining claim has been cancelled or has expired or, if any area to which such licence or mining claim relates has been abandoned or has for any reason ceased to be part of the area to which such non-exclusive prospecting licence relates or of the prospecting area, mining area or claim area, as the case may be, the Minister may by notice in writing addressed and delivered to the person who was the holder of such licence or mining claim direct such person -

- (a) to demolish any buildings, structures or any other thing erected or constructed by such person in such area and to remove from such area all debris and any other object brought into such area, except in so far as the owner of the land which is situated in such area retains such buildings, structures or other thing on such conditions as may mutually be agreed upon between such owner and person;
- (b) to take all such steps as may be necessary to remedy to the satisfaction of the Minister any damage caused by any prospecting operations and mining operations carried on by such holder to the surface of, and the environment in, such area;
- (c) to take such other steps as may be specified in such notice as the Minister may deem necessary or expedient to give effect to any direction referred to in paragraph (a).

(2) If the person referred to in subsection (1) contravenes or fails to comply with a direction given under that subsection, the Minister may-

- (a) cause such goods to be removed or such steps to be taken and recover the cost thereof from such person;
- (b) subject to the provisions of paragraph (c), dispose of, in such manner as he or she may deem fit, all or any of the goods referred to in paragraph (a);
- (c) after having published a notice in the *Gazette* and in two newspapers circulating in the district in which the area from which the goods in question were removed setting out the Minister's intention to sell such goods and inviting any person who is the lawful owner of such goods to claim such goods-
 - (i) sell or cause to be sold by public auction or otherwise all or any of such property and recover the cost thereof from such person;
 - (ii) deduct from the proceeds of the sale-
 - (aa) the costs incurred by him or her in respect of the removal steps referred to in subsection (1) and the sale referred to in subparagraph (i) of this paragraph;
 - (bb) any amounts due and payable under the provisions of this Act.

(3) Any person referred to in subsection (1) who contravenes or fails to comply with a direction issued under that subsection shall be guilty of an offence and liable on conviction to a fine not exceeding R 100 000 or to imprisonment for a period not exceeding five years or to both such fine and such imprisonment.

129. Powers of Minister to obtain further information in relation to reconnaissance operations, prospecting operations or mining operations or minerals won, mined, sold or otherwise disposed of.

(1) Where the Minister has reason to believe that a person is capable of furnishing books, documents or any particulars of whatever nature in relation to reconnaissance operations, prospecting operations or mining operations or to minerals or groups of minerals won, mined, sold or otherwise disposed of, the Minister may by note in writing addressed and delivered to such person, direct such person

- (a) to furnish him or her with such books, documents or particulars within such period and in such manner as may be specified in such notice;
 - (b) to appear before the Commissioner or such other person as may be authorized by the Minister and identified in such notice at such time and place as may be specified in such notice to answer questions relating to those books, documents or particulars;
 - (c) to furnish the Commissioner or such other person as may be authorized by the Minister and identified in such notice at such time and place as may be specified in such notice with such books, documents or particulars as may be in his or her possession or under his or her control, as the case may be.
- (2) Any person who-
- (a) refuses or fails to comply with a notice issued under subsection (1);
 - (b) knowingly furnishes particulars which are false or misleading, shall be guilty of an offence and on conviction liable to a fine not exceeding R8 000 or to imprisonment for a period not exceeding 12 months or to both such fine and such imprisonment.

130. Liability of holders of licences or mining claims for pollution of environment or other damages or losses caused.

(1) When in the course of any reconnaissance operations, prospecting operations or mining operations carried on under any non-exclusive prospecting licence, a mining claim or a mineral licence, any mineral or group of minerals is spilled in the sea or on land or in any water on or under the surface of any land or the sea or such land or water is otherwise polluted or any plant or animal life, whether in the sea, other water in, on or under land, is endangered or destroyed or any damage or loss is caused to any person, including the State, by such spilling or pollution, the holder of such licence or mining claim shall forthwith -

- (a) report such spilling, pollution, loss or damage to the Minister;

- (b) take at his or her own costs all such steps as may be necessary in accordance with good reconnaissance practices, good prospecting practices or good mining practices or otherwise as may be necessary to remedy such spilling, pollution, loss or damage.

(2) If the holder of a licence or mining claim referred to in subsection (1) fails to comply with the provisions of paragraph (b) of that subsection within such period as the Minister may deem in the circumstances to be reasonable, the Minister may direct by notice in writing addressed and delivered to such holder to take within such period as may be specified in such notice such steps as may be so specified in order to remedy the spilling, pollution or damage or loss, and the Minister may, if such holder fails to comply with such directions to the satisfaction of the Minister within the period specified in such notice or such further period as the Minister may on good cause shown allow in writing, cause such steps to be taken as may be necessary to remedy such spilling, pollution or damage or loss and recover in a competent court the costs incurred thereby from such holder.

131. General right of appeal.

Any person who feels aggrieved with any action or decision taken or made by the Commissioner in terms of any provision of this Act, may, within 30 days as from the date on which such action or decision was made known to such person, lodge an appeal against any such action or decision, and thereupon the Minister may confirm, set aside or amend any such action or decision.

132. Service of documents.

(1) Any document, notice or other communication required or authorized under the provisions of this Act to be given or delivered to any person by the Minister the Commissioner or any officer authorized thereto be deemed to have been given or delivered -

- (a) A delivered to such person personally;
- (b) if despatched by registered post addressed to such person at his or her last known address which may be any such place or office as is referred to in paragraph (c) or his or her last known post office box number or private bag number or that of his or her employer or accredited agent if any;

- (c) if left with some adult person apparently residing at or occupying or employed at his or her last known abode or office or place of business; or
- (d) in the case of a company-
 - (i) if delivered to the public officer of the company;
 - (ii) left with some adult person apparently residing at or occupying or employed at its registered address;
 - (iii) if despatched by registered post addressed to the company or its public officer at its or his or her last known address, which may be any such office or place as is referred to in subparagraph (ii) or its or his or her last known post office box number or private bag number or that of its or his or her employer; or
 - (iv) if transmitted by means of a facsimile transmission to the person concerned at the registered office of the company.

(2) Any document, notice or other communication referred to in subsection (1) which has been given or delivered in the manner contemplated in paragraph (b) or (d)(iii) of that subsection shall, unless the contrary is proved, be deemed to have been received by the person to whom it was addressed at the time when it would, in the ordinary course of post have arrived at the place to which it was addressed.

133. Miscellaneous offences and penalties.

Any person who-

- (a) without reasonable excuse, obstructs, hinders or prevents the holder of any non-exclusive prospecting licence, mining claim or mineral licence, the Minister, the Commissioner or any other officer referred to in section 4(2) from exercising or performing any right, power, duty or function conferred or imposed upon him or her by or under any provision of this Act;

- (b) makes or causes to be made in connection with any application made in terms of any provision of this Act any statement which is false or misleading knowing it to be false or misleading;
- (c) submits or causes to be submitted in connection with any such application or any notice, report, return or statement issued or given under any provision of this Act or the terms and conditions of any non-exclusive prospecting licence, mining claim or mineral licence, any document, information or particulars which are false or misleading knowing them to be false or misleading;
- (d) fraudulently and, with the intent to mislead any other person to believe that a mineral or group of minerals of a mineable nature exist at any place, places or deposits or causes to be placed or deposited any mineral or group of minerals in or at any such place;
- (e) fraudulently and with the intent to defraud mingles or causes to be mingled with any sample of ore any substance which will increase the value or nature of such ore;
- (f) intentionally or negligently transgresses the boundaries of his or her reconnaissance area, prospecting area, claim area, retention area or mining area while carrying on reconnaissance operations, prospecting operations or mining operations or such boundaries to be so transgressed; or
- (g) without any lawful reason removes, destroys, disfigures or displaces any trigonometrical station or a beacon or boundary mark of any prospecting area, claim area, retention area or mining area,

shall be guilty of an offence and on conviction be liable to a fine not exceeding R8 000 or to imprisonment for a period not exceeding 12 months or to both such fine and such imprisonment.

134. Jurisdiction of court in relation to offences under this Act committed at sea.

Notwithstanding the provisions of any law to the contrary, the High Court of Namibia or a magistrate's court which would otherwise have jurisdiction shall have jurisdiction to try any offence under this Act which is

committed or alleged to have been committed within the territorial sea referred to in section 2 of the Territorial Sea and Exclusive Economic Zone of Namibia Act, 1990 (Act 3 of 1990), the exclusive economic zone referred to in section 4 of that Act and the continental shelf referred to in section 6 of that Act.

135. Evidence.

The production in any criminal or civil proceedings in any court of law or other proceedings instituted in terms of the provisions of this Act of-

- (a) any certificate purporting to have been signed by the Commissioner certifying whether or not on a date specified in such certificate-
 - (i) a licence was issued, renewed or transferred to a person so specified;
 - (ii) a mining claim was registered or renewed in the name of, or transferred to, a person so specified;
 - (iii) any interest in such a licence or mining claim has been granted, ceded or assigned to a person so specified;
 - (iv) any person so specified has been joined as a joint holder of such a licence or claim or any interest in such licence or claim;
 - (v) any term and condition so specified is or was a term and condition of a licence or mining claim;
 - (vi) a person mentioned in such certificate is or was a holder of such a licence or mining claim;
 - (vii) a licence has been issued or mining claim registered in respect of any area of land so specified;
- (b) an extract from the register referred to in section 36(2) or 51 certified by the Commissioner to be true and correct,

shall, unless the contrary is proved, be conclusive evidence of the facts mentioned therein.

136. Forfeiture orders.

If a person is convicted of an offence under this Act the court which has convicted the person may, in addition to any other penalty imposed or any forfeiture ordered ~~and~~ any other law, order any mineral or group of minerals won or mined in the course of the commission of such offence be forfeited to the State or, in the event of any such mineral or group of minerals having been sold or otherwise disposed of, an amount equal to the proceeds of the sale or the market value of such mineral or group of minerals, as determined by the court, be paid by such person for the benefit of the State Revenue Fund.

137. Exemptions.

(1) The Minister may, whenever he or she deems it necessary or expedient for the better administration of the provisions of this Act -

- (a) from time to time by notice in the *Gazette* exempt, subject to such conditions as may be determined by him or her and specified in such notice, the holders of non-exclusive prospecting licences, mining claims or mineral licences from the provisions of section 16(1)(c) and (5), 31(1)(d) and (5), 67(1)(c) and (5), 77(1)(d) and (5), 90(1)(d) and (4) or 127 in relation to any mineral or group of minerals specified in such notice or any quantity or mass of such mineral or group of minerals so specified;
- (b) upon an application made by the holder of a non-exclusive prospecting licence, mining claim or mineral licence in such form as may be determined in writing by the Minister, by notice in writing exempt, subject to such conditions as may be determined by him or her and specified in such notice, any such holder from the provisions of the said sections in relation to any mineral or group of minerals specified in such notice or any quantity or mass of such mineral or group of minerals so specified;
- (c) upon an application made by any person in such form as may be determined in writing by the Minister, by notice in writing exempt, subject to such conditions as may be determined by him or her and specified in such notice, any such person from any provision of Part XIV in relation to any high value mineral specified in such notice or any quantity or mass of such high value mineral so specified, if the Minister is on reasonable grounds

satisfied that such person is *abona fide* collector of such high value minerals referred to in that Part,

and may at any time by like notice amend or withdraw such notice.

(2) An application for the exemption referred to in subsection (1)(b) or (c), shall be made to the Minister in such form as may be determined in writing by the Commissioner and shall be accompanied by such application fee, if any, as may be determined under section 123, together with such documents and information as may be required by the Minister.

138. Delegation of powers.

(1) The Minister may delegate any power conferred upon him or her by this Act, excluding any power which is required to be exercised by notice in the *Gazette*, to the Permanent Secretary, the Commissioner or any other officer in the service of the Ministry of Mines and Energy.

(2) Any delegation under subsection (1) shall not prevent the Minister from exercising the power concerned personally.

139. Repeal and amendment of laws, and savings.

(1) Subject to the provisions of this section, the laws specified in column 2 of Schedule 2 are hereby repealed or amended to the extent shown in column 3 of that Schedule.

(2) On the date of commencement of this Act

- (a) the person appointed in terms of section 4(2) of the Mines, Works and Minerals Ordinance, 1968 (Ordinance 20 of 1968) (hereinafter referred to as the repealed Ordinance), in the office of the mining commissioner who was holding such office on the date immediately before such date of commencement, shall be deemed to have been appointed under section 4 of this Act as the Commissioner;
- (b) subject to the provisions of subsection (8), any prospecting licence issued in terms of section 20 of the repealed Ordinance which was in force on the date immediately before such date of commencement, shall be deemed to be a non-exclusive prospecting

licence issued in terms of section 21 of this Act on the date of such commencement to the person who was the holder of such prospecting licence on the date immediately before such date of commencement for a period equal to the unexpired portion of the period for which it was issued in terms of the said section 20 on such terms and conditions as may have been determined in terms of the repealed Ordinance in respect of such prospecting licence;

- (c) subject to the provisions of subsections (3), (7) and (8), any claim registered in terms of section 29 of the repealed Ordinance which was so registered on the date immediately before such date of commencement, shall be deemed to be a mining claim registered in terms of section 36 of this Act on such date of commencement in favour of the person who was the holder on such first-mentioned date of the certificate of registration issued in terms of subsection (3) of the said section 29, in respect of such area and such mineral or group of minerals in respect of which such claim was so registered as if such claim were in terms of the said section 36 registered on such date of commencement;
- (d) subject to the provisions of subsections (4), (7) and (8), any prospecting grant embodied in a deed of grant and registered, or deemed to have been registered, in terms of section 60(1)(e) of the repealed Ordinance which was in force on the date immediately before such date of commencement, shall be deemed to be an exclusive prospecting licence issued in terms of section 70 of this Act on the date of such commencement to the person who was the holder of any such prospecting grant immediately before such commencement for a period equal to the unexpired portion of the period for which any such prospecting grant was granted or extended, and in respect of such area and such mineral or group of minerals and on such terms and conditions determined, in terms of the said section 60 in respect of such prospecting grant;
- (e) subject to the provisions of subsections (5), (7), (8) and (9) -

- (i) any mining title secured by way of a deed of conversion registered in terms of section 46(10) of the repealed Ordinance which was in force on the date immediately before such date of commencement; and
- (ii) any mining grant embodied in a deed of grant and registered in terms of section 61(6)(b) of the repealed Ordinance,

shall be deemed to be a mining licence issued in terms of section 93 of this Act on the date of such commencement

- (aa) in the case of the mining title referred to in subparagraph (i), to the person who was the owner of the mining area to which such mining title relates immediately before such commencement for a period of 25 years as from the date of such commencement or such shorter period as in the opinion of the Minister represents the estimated life of the mine in question and determined *mutatis mutandis* in accordance with the procedure as provided in section 92(4) by notice in writing addressed and delivered to such person in respect of such mining area and such mineral or group of minerals and on such terms and conditions determined in terms of the provisions of the repealed Ordinance; or
- (bb) in the case of the mining grant referred to in subparagraph (ii), to the person who was the holder of such mining grant immediately before such commencement for a period of 25 years as from the date of such commencement or such shorter period as in the opinion of the Minister represents the estimated life of the mine in question and determined *mutatis mutandis* in accordance with the procedure as provided in section 92(4) by notice in writing addressed and delivered to such person in respect of the mining area to which such mining grant relates and such mineral or group of minerals and on such terms and conditions determined in terms of section 61(1) of the repealed Ordinance;

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- (f) anything else done under any provision of the repealed Ordinance before its repeal under subsection (1) which may be done under a corresponding provision of this Act, shall be deemed to have been done under such corresponding provision;
- (g) any reference in any law or document
- (i) to the mining commissioner appointed under section 4(2) of the repealed Ordinance, shall be construed as a reference to the Commissioner;
 - (ii) to a prospecting licence issued in terms of section 20 of the repealed Ordinance, shall be construed as a reference to a non-exclusive prospecting licence;
 - (iii) to a claim registered in terms of section 29 of the repealed Ordinance or the area or holder of such claim, shall be construed as a reference to a mining claim or the claim area or the holder of a mining claim, respectively;
 - (iv) to a prospecting grant referred to in section 60(1)(e) of the repealed Ordinance or the area or holder of such prospecting grant shall be construed as a reference to an exclusive prospecting licence, the holder of an exclusive prospecting licence or the prospecting area, respectively;
- (h) any reference in any law or document-
- (i) to any mining title referred to in section 44 of the repealed Ordinance or the owner of the mining area to which such mining title relates;
 - (ii) to any mining grant referred to in section 61 of the repealed Ordinance or the holder or the grant area of such grant,
- shall be construed as a reference to a mining licence, the holder of a mining licence or a mining area, respectively.

- (3) (a) Notwithstanding the provisions of section 123, the claim fees which were payable in respect of such claim in terms of section 30 of the repealed Ordinance immediately before the date of commencement of this Act, shall continue to be so payable as if the repealed Ordinance had not been repealed by subsection (1) and this Act had come into operation on a date 12 months as from such date of commencement.
- (b) The holder of a mining claim referred to in paragraph (c) of subsection (2) shall on a date not later than 12 months as from such date of commencement-
- (i) furnish the Commissioner with the particulars referred to in paragraphs (d), (e) and (f) of subsection (4) of section 26 of the repealed Ordinance;
 - (ii) submit to the Commissioner-
 - (aa) a sketch-plan of the claim area and a certificate prepared *mutatis mutandis* in accordance with the provisions of section 33(2)(e) of this Act;
 - (bb) a report in duplicate in such form as the Commissioner may determine on all prospecting operations and mining operations carried on on the area of such claim as from the date on which such claim was registered in terms of section 29 of the repealed Ordinance together with the results of all analytical, metallurgical and mineralogical work relating thereto.
- (c) Any holder of a mining claim who contravenes or fails to comply with the provisions of paragraph (a) or (b) shall be guilty of an offence and on conviction liable to a fine not exceeding R8 000 or to imprisonment not exceeding 12 months or to both such fine and such imprisonment.
- (4) Notwithstanding the provisions of-

- (a) section 42, as applied by section 75, the holder of an exclusive prospecting licence contemplated in paragraph (d) of subsection (2) shall carry on the prospecting operations to which such exclusive prospecting licence relates and incur such expenditure which are, in terms of the programme of prospecting operations specified in the deed of grant in question, required to be carried on and expended;
- (b) section 123, the rental which was payable in respect of the prospecting grant referred to in paragraph (d) of subsection (2) in terms of section 60(2)(c) of the repealed Ordinance immediately before the date of commencement of this Act, shall continue to be so payable as if the repealed Ordinance had not been repealed by subsection (1) and this Act had come into operation on the date on which such grant is required to be extended as contemplated in section 60(1)(b) of the repealed Ordinance.
- (5) Notwithstanding the provisions of -
- (a) section 123 -
- (i) in the case of the mining title referred to in paragraph (e) of subsection (2), the mining area fee payable in respect of the mining area to which the mining title so referred to relates immediately before the date of commencement of this Act, shall, continue to be so payable as if the repealed Ordinance had not been repealed by subsection (1) and this Act had come into operation on the date on which the first half year contemplated in section 47(2) of the repealed Ordinance after the commencement of this Act had expired;
- (ii) in the case of the mining grant referred to in paragraph (e) of subsection (2), the rental payable in respect of the grant area to which the mining grant so referred to relates immediately before the date of commencement of this Act, shall continue to be so payable as if the repealed Ordinance had not been repealed by subsection (1) and this Act had come into operation on the date on which such rental would have been payable after the date of commencement of this Act;

(b) section 78, the holder of a mining licence referred to in paragraph (e) of subsection (2) shall be entitled to apply *mutatis mutandis* in accordance with the provisions of Part XI of this Act for a mineral deposit retention licence as if such holder were the holder of an exclusive prospecting licence or a mining claim, except when a notice referred to in subsection (7) has been delivered to him or her.

(6) Subject to the provisions of subsection (7), the provisions of this Act shall not be construed as detracting from the validity of the agreement known as the Halbscheid Agreement in so far as it was in force on the date immediately before the commencement of this Act.

(7) The Minister may, if he or she deems it necessary in the interests of the development of the mineral resources of Namibia, by notice in writing addressed and delivered to the holder of a mining claim contemplated in paragraph (c) of subsection (2), the holder of an exclusive prospecting licence contemplated in paragraph (d) of that subsection, the holder of a mining licence contemplated in paragraph (e) of subsection (2) or any party to the agreement referred to in subsection (6), require such holder or party -

(a) to enter into negotiations with the Minister in relation to -

- (i) the continuation or variation of the terms and conditions to which such mining claim, exclusive prospecting licence, mining licence or agreement, as the case maybe, relates;
- (ii) the discontinuance of the registration of such mining claim or of such exclusive prospecting licence, mining licence or agreement or of any terms and conditions to which such mining claim, licence or agreement relates, and the registration of such mining claim or the issue of an exclusive prospecting licence or a mining license, in accordance with the provisions of this Act, in relation to any rights connected with such first mentioned mining claim, exclusive prospecting licence, mining licence, or agreement;

- (b) to furnish the Minister with copies of such documents or other information which is in the possession or under the control of such holder or party as the Minister may require for purposes of any negotiations contemplated in paragraph (a).
- (8) (a) A person referred to in section 78(2) of the Petroleum (Exploration and Production Act), 1991 (Act 2 of 1991), shall submit, within a period of 90 days as from the date of the commencement of this Act, particulars of any right granted to him or her under the repealed Ordinance in relation to natural oil, as defined in section 1 of the repealed Ordinance.
- (b) Any person referred to in paragraph (a) who fails to comply with the provisions of that paragraph shall be deemed to have abandoned all rights so granted, unless the Minister determines on good cause shown otherwise by notice in writing addressed and delivered to such person.
- (9) Notwithstanding the provisions of paragraph (e) of subsection (2), the Minister may -
- (a) if he or she is on reasonable grounds satisfied that the person who was the owner of a mining area referred to in the said paragraph (e) or the holder of a mining grant so referred to, has no intention of carrying on any mining operations on the mining area to which such mining title or mining grant relates, *mutatis mutandis* in accordance with the procedure as provided in section 92(4) by notice in writing addressed and delivered to such person declare that such mining title or mining grant, as the case may be, has lapsed;
- (b) if he or she is on reasonable grounds satisfied that the person who was the owner of a mining area referred to in the said paragraph (e) or the holder of a mining grant so referred to, is not carrying on any such mining operations on account of the fact that there exist grounds by virtue of which a mineral deposit retention licence can be issued to such person in terms of the provisions of this Act, grant, *mutatis mutandis* in accordance with the procedure as provided in section 92(4) and subject to the provisions of Part XI, a mineral deposit retention licence to such person;

(c) if he or she is on reasonable grounds satisfied that the person who was the owner of a mining area referred to in the said paragraph (c) or the holder of a mining grant so referred to, is not carrying on any such mining operations on account of the fact that the circumstances relating to the mining area to which such mining title or mining grant relates justify the granting of an exclusive prospecting licence, *mutatis mutandis* in accordance with the procedure as provided in section 92(4) by notice in writing addressed and delivered to such person declare that the provisions of paragraph (d) of subsection (2) of this section shall apply *mutatis mutandis* in relation to such person as if such person were on the date immediately before the commencement of this Act the holder of a prospecting grant referred to in that paragraph.

(10) Any licence issued under section 2 of the Dealing in Unwrought Precious Metals Proclamation, 1938 (Proclamation 5 of 1938), which was in force on the date immediately before the date of commencement of this Act shall be deemed to be a permit issued under section 105 of this Act on the date of such commencement.

140. Short title and commencement

This Act shall be called the Minerals (Prospecting and Mining) Act, 1992, and shall come into operation on a date to be fixed by the Minister by notice in the *Gazette*.

SCHEDULE 1

GROUPS OF MINERALS, ELEMENTS AND ROCK (Section 1)

Part 1

Base and rare metals group

Aluminium, antimony, arsenic, beryllium, bismuth, cadmium, caesium, chromium, cobalt, copper, gallium, germanium, hafnium, indium, iron, lead, manganese, mercury, molybdenum, nickel, niobium, radium, "Rare Earths" or lanthanides, including the actinides, scandium and yttrium, rhenium, rubidium, selenium, tantalum, tellurium, thallium, tin, tungsten, vanadium, zinc or zirconium, but does not include any such minerals if such mineral is incidentally included in a mineral falling in any other group of minerals.

Part 2
Dimension stone group

Rock material occurring naturally in, on or under the earth which is capable of being cut, shaped or used in blocks, slabs, sheets and tiles for the construction or cladding of buildings, pavings, monuments and memorials.

Part 3
Industrial minerals group

Alunite, andalusite-sillimanite-kyanite, anhydrite, aplite, asbestos, barite, beryl (excluding beryl as a source of beryllium metal or as a semiprecious stone), boron minerals, calcium carbonate, celestite, clay (including bentonite and Fuller's Earth (Palygorsite and attapulgite), ball clay, halloysite, hectorite, kaolin, refractory clay), corundum, diatomite, dolomite, epsomite, feldspar, fluorite, garnet (for industrial purposes), graphite, gypsum, heavy mineral sands, iodine minerals, leucoxene, lithium minerals, limestone and marble, magnesite, mica, nepheline syenite, nitrate, olivine, perlite, phosphate, fossil guano, quartz (for industrial purposes), picture-stone, potash, pumice, pyrophyllite, salt, sepiolite, silica sand, soapstone, soda-ash and other sodium compounds, strontianite sulphur and pyrite, talc, vermiculite, wollastonite.

Part 4
Non-nuclear fuel minerals group

Coal and oil-shale and all substances related thereto or derived therefrom, but does not include petroleum as defined in section I of the Petroleum (Exploration and Production) Act, 1991 (Act 2 of 1991).

Part 5
Nuclear fuel minerals group

Source material containing—

- (a) uranium, expressed as uranium oxide (U_3O_8), of more than 0.006 per cent;
- (b) thorium, expressed as thorium oxide (ThO_2), of more than 0.5 per cent,

and of which the mass is more than a half kilogram.

Part 6
Precious metals group

Gold, silver, platinum, palladium, osmium rhodium, iridium and ruthenium, but does not include any such mineral if such mineral is incidentally included in a mineral falling in any other group of minerals.

Part 7
Precious stones group

Diamonds, emeralds, rubies and sapphires.

Part 8
Semi-precious stones group

Amazonite, aventurine, beryl (including aquamarine, heliodor and morganite, but excluding beryl as a source of beryllium metal or as an industrial mineral), chrysoberyl, chrysocolla, cordierite, diopside, dumortierite, garnet, milarite, quartz (including amethyst, citrine rock crystal, rose and strawberry quartz, agate, carnelian, chalcedony, chrysoprase, jasper, moss agate, hyalite, opal, pietersite and tiger's eye), sodalite, topaz, tourmaline and turquoise.

SCHEDULE 2

LAWS REPEALED OR AMENDED
(Section 139)

Column 1	Column 2	Column 3
No. and year of law	Title	Extent of repeal or amendment
Proclamation 5 of 1938	Dealing in Unwrought Precious Metals Proclamation, 1938	The repeal of the whole
Proclamation 16 of 1941	Diamond Taxation Proclamation, 1941	(a) The repeal of section 3; (b) the amendment of section 12 by the deletion of the words "the diamond export duty and"; (c) the amendment of section 13 - (i) by the deletion of subsection (1); (ii) by the deletion in subsection (3) of the words "diamond export duty and"; (d) the amendment of section 16 by the deletion of the words "the diamond export duty,"; (e) the amendment of section 18 by the deletion in subsection (2) of the words "the diamond export duty,".
Act 43 of 1963	Nuclear Installations Act (Licensing and Security Systems), 1963	The repeal of the whole.
Act 39 of 1965	Atomic Energy and Nuclear Installations (Licensing and Security) Amendment Act, 1965	The repeal of the whole.
Act 89 of 1967	Nuclear Installations (Licensing and Security) Amendment Act, 1967	The repeal of the whole.
Act 90 of 1967	Atomic Energy Act, 1967	The repeal of the whole.
Ordinance 20 of 1968	Mines, Works and Minerals Ordinance, 1968	The repeal of the whole, except in so far as it relates to the appointment and powers, duties and functions of the Chief Inspector of Mines and an inspector of mines, and the safety and health of persons employed in or in connection with mines and works.
Proclamation R.87 of 1969	Dealing in Unwrought Precious Metals Amendment Proclamation, 1969	The repeal of the whole.

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Proclamation R19 of 1969	Mines Works and Minerals Amendment Proclamation, 1969	The repeal of the whole.
Proclamation R.90 of 1969	Mining Titles Registration Proclamation, 1969	The repeal of the whole.
Act 34 of 1970	Atomic Energy Amendment Act, 1970	The repeal of the whole.
Act 73 of 1971	Atomic Energy Amendment Act, 1971	The repeal of the whole.
Act 47 of 1972	Mines, Works and Minerals in South-West Africa Amendment Act, 1972	The repeal of the whole.
Act 46 of 1973	Sea Birds and Seals Protection Act, 1973	The deletion of subsection (3) of section 15.
Act 62 of 1973	General Law Amendment Act, 1973	The repeal of section 33.
Act 38 of 1974	Nuclear Installations (Licensing and Security) Amendment Act, 1974	The repeal of the whole.
Act 39 of 1974	Atomic Energy Amendment Act, 1974	The repeal of the whole.
Act 63 of 1975	Expropriation Act, 1975	The repeal of sections 74 and 75.
Act 91 of 1976	Nuclear Installations (Licensing and Security) Amendment Act, 1976	The repeal of the whole.
Act 76 of 1977	Atomic Energy Amendment Act, 1977	The repeal of the whole.
Act 22 of 1978	Nuclear Installations (Licensing and Security) Amendment Act, 1978	The repeal of the whole.
Act 46 of 1978	Atomic Energy Amendment Act, 1978	The repeal of the whole.
Proclamation AG.57 of 1978	Mineral Rights Proclamation, 1978	The repeal of the whole.
Act 46 of 1979	Atomic Energy Amendment Act, 1979	The repeal of the whole.
Act 26 of 1980	Mine, Works and Minerals Amendment Act, 1980	The repeal of the whole.
Act 4 of 1981	Mines, Works and Minerals Amendment Act, 1981	The repeal of the whole.
Act 7 of 1981	Atomic Energy Amendment Act, 1981	The repeal of the whole.
Act 2 of 1991	Petroleum (Exploration and Production) Act, 1991	(a) The amendment of-section 4 by the deletion in paragraph (i) of subsection (1) of

the words "*mutatis mutandis* in

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		<p>accordance with the provisions of sections 10 and 11 of the Mines, Works and Minerals Ordinance, 1968 (Ordinance 20 of 1968)";</p> <p>(b) section 16 by the substitution in paragraph (c) of subsection (1) for the words "claim, grant area or mining area, as defined in section 1 of the Mines, Works and Minerals Ordinance, 1968 (Ordinance 20 of 1968)" of the words "mining area or claim area as defined in section 1 of the Minerals (Prospecting and Mining) Act, 1992"; and</p> <p>(c) section 78 by the deletion of subsection (1) in so far as it relates to the amendment of the Mines, Works and Minerals Ordinance, 1968 (Ordinance 20 of 1968).</p>
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