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UNESCO Region: AFRICA

SITE NAME: Greater St. Lucia Wetland Park

DATE OF INSCRIPTION: 4th December 1999

STATE PARTY: South Africa

CRITERIA: N (ii) (iii) (iv)

DECISION OF THE WORLD HERITAGE COMMITTEE:

Excerpt from the Report of the 23rd Session of the World Heritage Committee

The Committee decided to inscribe the Greater St. Lucia Wetland Park on the World Heritage List under natural criteria (ii), (iii) and (iv).

The St. Lucia site consists of thirteen contiguous protected areas with a total size of 234,566 hectares. The site is the largest estuarine system in Africa and includes the southernmost extension of coral reefs on the continent. The site contains a combination of on-going fluvial, marine and aeolian processes that have resulted in a variety of landforms and ecosystems. Features include wide submarine canyons, sandy beaches, forested dune cordon and a mosaic of wetlands, grasslands, forests, lakes and savanna. The variety of morphology as well as major flood and storm events contribute to ongoing evolutionary processes in the area. Natural phenomena include: shifts from low to hyper-saline states in the Park's lakes; large numbers of nesting turtles on the beaches; the migration of whales, dolphins and whale-sharks off-shore; and huge numbers of waterfowl including large breeding colonies of pelicans, storks, herons and terns. The Park's location between sub-tropical and tropical Africa as well as its coastal setting has resulted in exceptional biodiversity including some 521 bird species.

The Committee commended the Government of South Africa on three issues: (a) for the decision to ban sand mining in the area and to subsequently nominate the area for World Heritage; (b) the long history of conservation in the area and the professional work of the Kwazulu-Natal Nature Conservation Service in maintaining the site; (c) the launch of the Lubombo Spatial Development Initiative with the neighbouring countries of Swaziland and Mozambique which provides the regional conservation and development framework for the Greater St. Lucia Area and which will further strengthen community conservation work there.

The Committee noted the possible extensions of the Greater St. Lucia including a possible future transfrontier site with Mozambique. It urged the completion of the land claim negotiations and confirmed that World Heritage site designation should not prejudice this process.

The Observer of France highlighted that this is the first nomination from South Africa and that the Committee's decision to inscribe it is fully in line with the Global Strategy. The Delegate of South Africa thanked the Committee on behalf of the people of South Africa for the inscription of its first site on the World Heritage List.

BRIEF DESCRIPTIONS

The ongoing fluvial, marine and aeolian processes in the site have produced a variety of landforms including coral reefs, long sandy beaches, coastal dunes, lake systems, swamps, and extensive reed and papyrus wetlands. The interplay of the park's environmental heterogeneity with major floods and coastal storms and a transitional geographic location between sub-tropical and tropical Africa has resulted in exceptional species diversity and on-going speciation. The mosaic of landforms and habitat types creates superlative scenic vistas. The site contains critical habitat for a range of species from Africa's marine, wetland and savannah environments.

1.b State, Province or Region: KwaZulu-Natal

1.d Exact location: 26° 51' S, 32° 6' E

UNITED NATIONS EDUCATION SCIENTIFIC AND
CULTURAL ORGANIZATION

CONVENTION CONCERNING THE PROTECTION OF THE
WORLD CULTURAL AND NATURAL HERITAGE

NOMINATION PROPOSAL

for

THE GREATER ST LUCIA WETLAND PARK

to be

LISTED AS A WORLD HERITAGE SITE

Signed (on behalf of the State Party)

Z. Paulo Jordan

Full name

ZWELEDINGA Paulo Jordan

Title

MINISTER of ENVIRONMENTAL AFFAIRS & TOURISM.

Date

17 June 1978.

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CULTURAL ORGANIZATION

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Prepared by:

**KWAZULU-NATAL NATURE CONSERVATION SERVICE
REPUBLIC OF SOUTH AFRICA
1998**





"This unique combination of socio-political history, environmental and biological diversity makes the Greater St Lucia Area a very special asset for the nation. There is no substitute." (Leon *et al*, 1993).

ACKNOWLEDGEMENTS

The nomination document was prepared by the Planning Division of The KwaZulu-Natal Nature Conservation Service. Principal authors were Roger Porter, Trevor Sandwith and Bill Bainbridge. The following contributed directly to the compilation of information used in the nomination : Dr Orty Bourquin, Dr Peter Goodman, Dr David Johnson, Dr Robert Kyle, Dr David Rowe-Rowe, Andy Blackmore, Mike Coke, Frank Junor, Terry Juul, Chris McBride, Wayne Matthews, Ricky Taylor and Mark Serfontein.

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SCHEDULES

1. Checklist of seed plants
2. Checklist of seaweeds
3. Checklist of butterflies in the Park
4. Checklist of dungbeetles
5. Provisional list of hole-nesting wasps
6. Some important molluscs
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12. Checklist of birds
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FIGURES

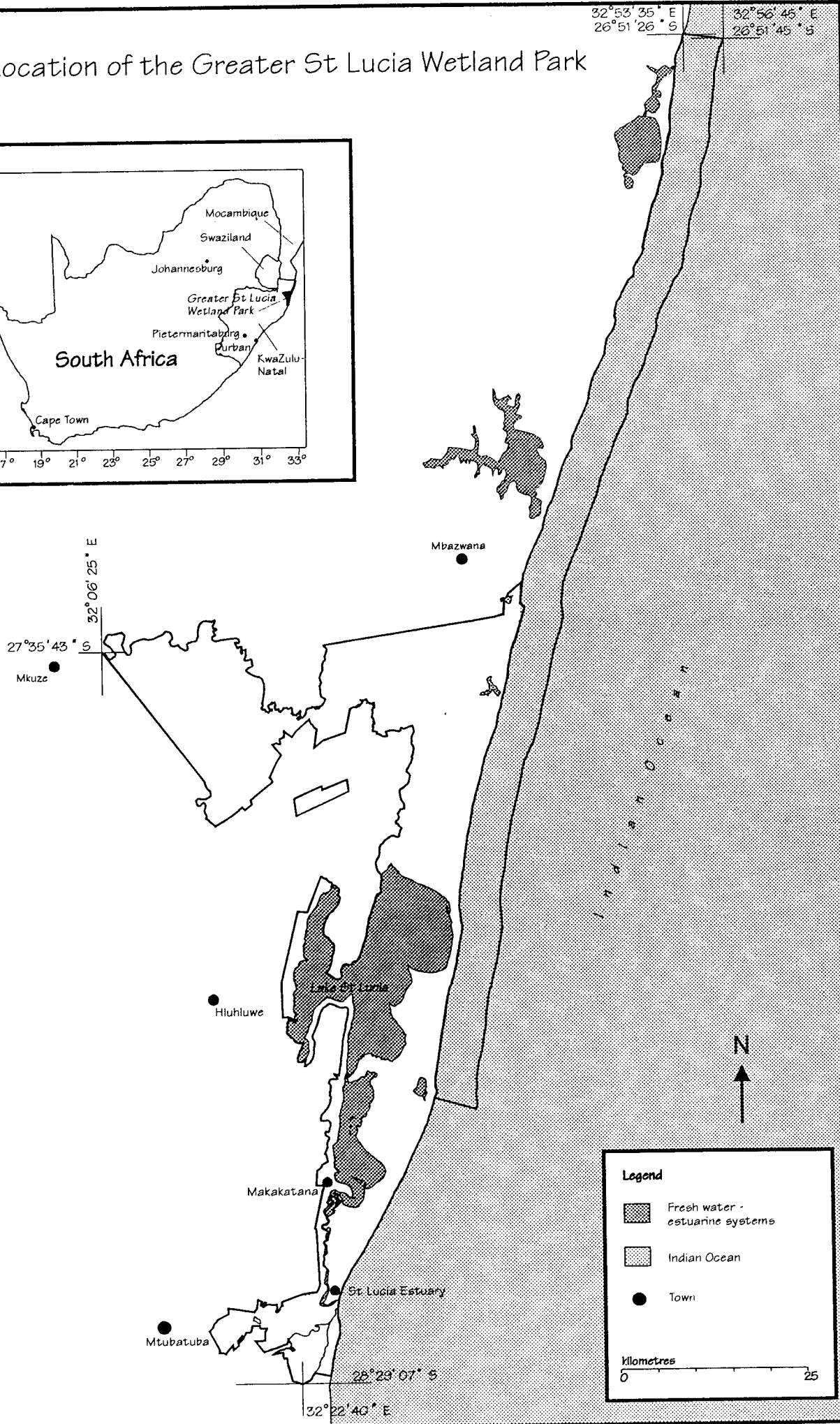
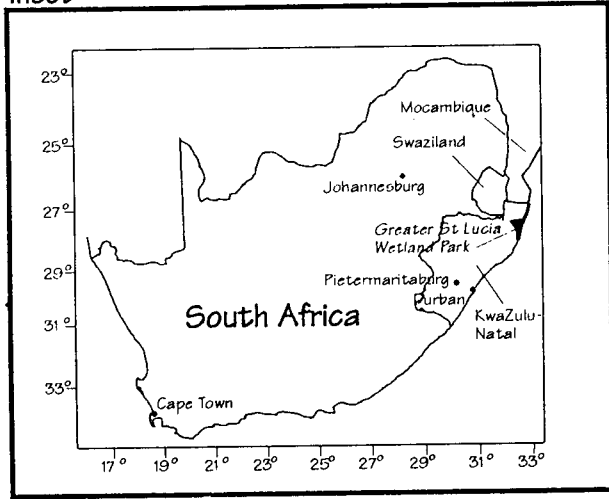
1. **Location of the Greater St Lucia Wetland Park.**
2. **The Greater St Lucia Wetland Park and its component areas.**
3. **Zonation of the Greater St Lucia Wetland Park.**
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7. **Geological map of Maputaland.**

APPENDICES




1. **Bibliography : Terrestrial areas.**
2. **Bibliography : Lake and Estuary.**
3. **Bibliography : St Lucia and Maputaland Marine Reserves.**
4. **Mkuzi Game Reserve Management Plan**
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6. **Kosi Bay/Coastal Forest Reserve Management Plan and boundary details**
7. **Booklet : Taylor, R.H. 1991. The Greater St Lucia Wetland Park. Published by Parke-Davis for the Natal Parks Board**
8. **Bibliography : Supplementary Bibliography of Publications**

Figure 1 Location of the Greater St Lucia Wetland Park

Inset



Legend

-  Fresh water - estuarine systems
-  Indian Ocean
-  Town

Kilometres
0 ————— 25

Figure 3 Zonation of the Greater St Lucia Wetland Park

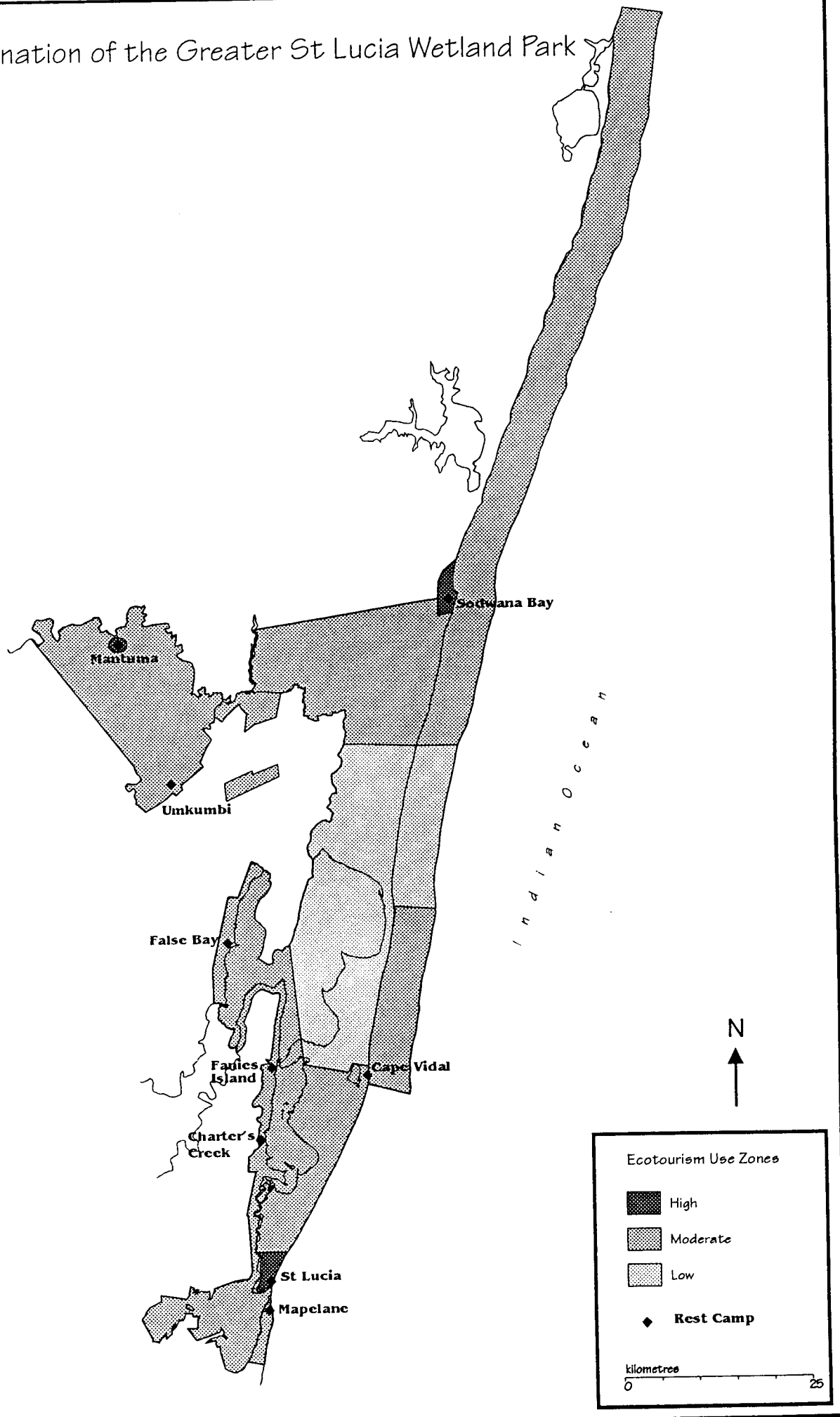


Figure 4 Geographic Features within the Greater St Lucia Wetland Park

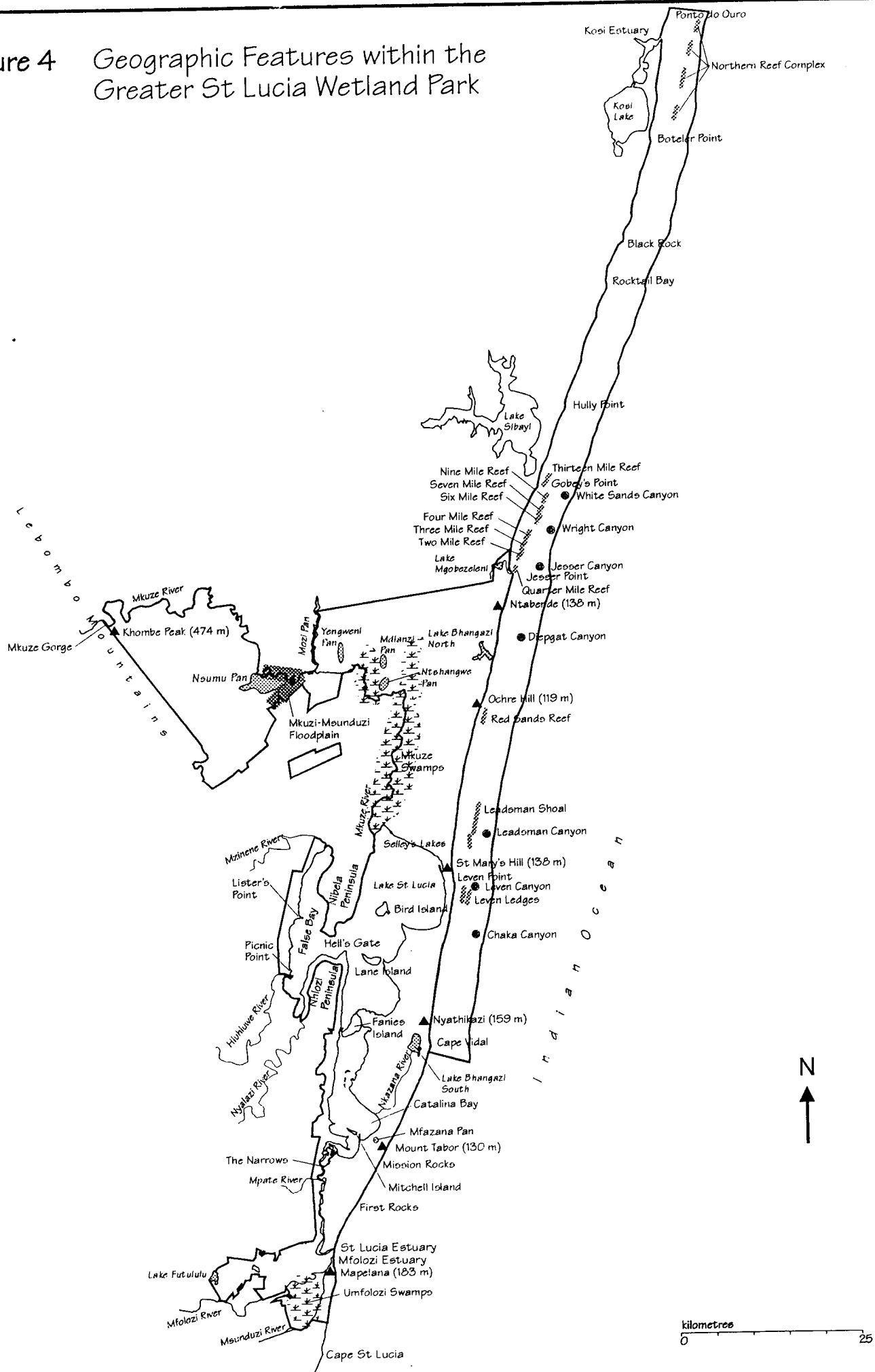
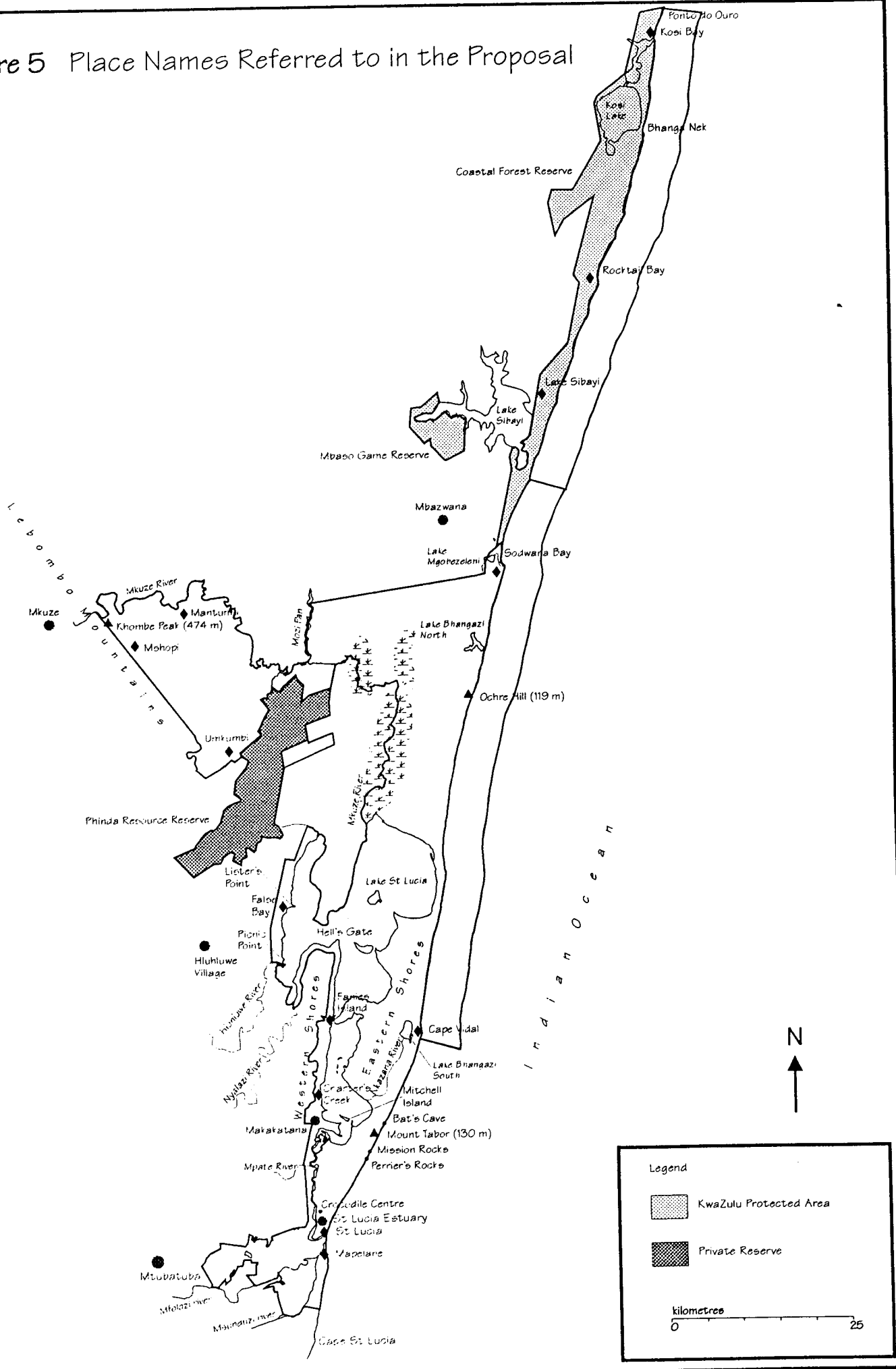


Figure 5 Place Names Referred to in the Proposal

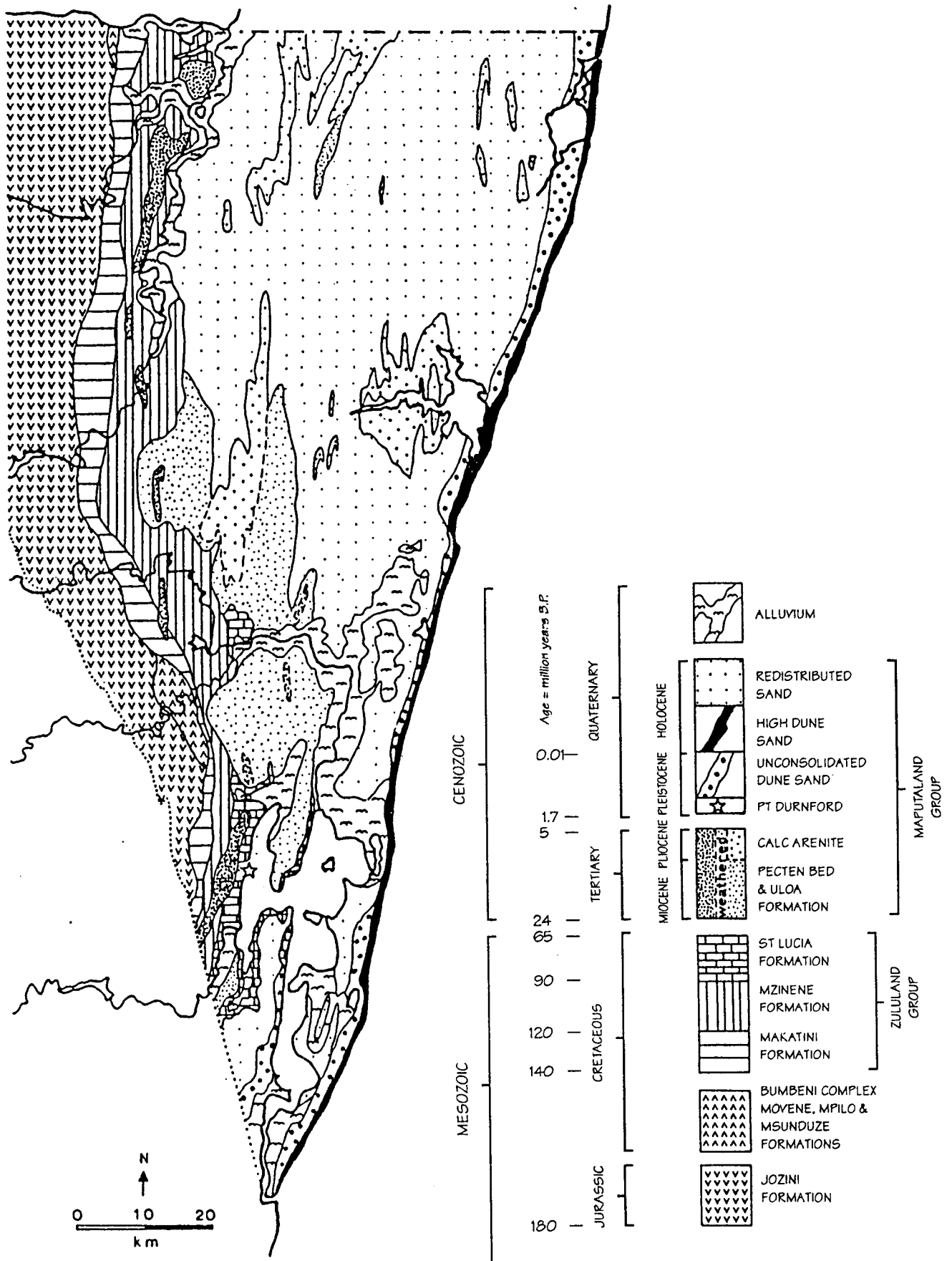


Legend

- KwaZulu Protected Area
- Private Reserve

kilometres
 0 ————— 25

Figure 7 Geological Map of Maputaland (After Watkeys *et al*, 1993)



1. IDENTIFICATION OF THE PROPERTY

1.1 Country : Republic of South Africa

1.2 Province : KwaZulu-Natal

1.3 Name of Property : The Greater St Lucia Wetland Park

1.4 Location

The Greater St Lucia Wetland Park (hereafter referred to as the "Park") is situated on the south-eastern coast of Africa. A map of the location of the Park within South Africa is given in Figure 1. The extreme western edge of the Park lies at 32° 06' 25" E and extends to 32° 56' 46" E, the northern border is located at 26° 51' 26" S and the Park extends southward to 28° 29' 07" S.

1.5 Maps of the area proposed for inscription

Included with this submission is a set of 12 maps at a scale of 1:50 000 on which the boundaries of the nomination site, the Park, have been demarcated with the exception of the Coastal Forest Reserve component. Details of the boundary of this reserve are given in Appendix 6. The Park is also indicated on a colour satellite photograph. The various protected areas that collectively constitute the nomination site are shown in Figure 2, the zonation for ecotourism use in Figure 3, principal geographic features in Figure 4, and place names referred to in this proposal in Figure 5.

1.6 Area of Property and Zonation

Table 1 lists the year of declaration and the extent of each component protected area that collectively comprise the Park. The total extent of the Park is 289 376 ha. Figure 3 shows the zonation of the Park where the low intensity use zone may be regarded as being equivalent to the core area and the surrounding areas to a buffer zone. In addition compatible land-uses are present on privately-owned land adjacent to the Park such as the large Phinda Resource Reserve (Figure 5). Initiatives have been undertaken involving private and communal landowners towards establishing biosphere reserves (see section 5.1) in compliance with the guidelines of the Seville Strategy (UNESCO, 1996).

TABLE 1. COMPONENT PROTECTED AREAS OF THE GREATER ST LUCIA WETLAND PARK

LEGAL DESIGNATION	Area (ha)	Year of declaration
Cape Vidal State Forest	11 313	1956
Dukuduku State Forest	10 125	1956
Eastern Shores State Forest	12 873	1956
False Bay Park	2 247	1954
Makasa Nature Reserve	1 700	1992
Mapelane Nature Reserve	1 103	1953
Maputaland Marine Reserve	39 740	1987
Mkuzi Game Reserve	37 985	1912
Nyalazi State Forest	1 367	1956
Sodwana Bay National Park	1 155	1950
Sodwana State Forest	47 127	1956
St Lucia Game Reserve	36 826	1895
St Lucia Marine Reserve	44 280	1979
St Lucia Park	12 545	1939
Coastal Forest Reserve	21 772	1992
Lake Sibayi Freshwater Reserve	7 218	1994

GREATER ST LUCIA WETLAND PARK	TOTAL AREA:	289 376
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2. JUSTIFICATION FOR INSCRIPTION

2.1 Statement of significance

The Park comprises the last remaining subtropical area containing its original diverse components of wild plants and animals on the south-eastern coast of Africa, and one of the last remaining in the world. Within the nomination site are exceptional wetland, terrestrial and marine ecosystems with complement of species that include many endemic and internationally recognized threatened species. Landscapes are outstanding and the geomorphological processes by which they are formed are believed to be of universal importance given their evolution subsequent to the fragmentation of the Gondwana super-continent.

2.2 Comparative analysis

The natural systems protected within the Greater St Lucia Wetland Park are considered to be unique firstly in terms of their biophysical diversity, and secondly in terms of the hydrological and ecological functioning and associated adaptation of the biota of the St Lucia lake itself.

2.3 Integrity

This natural area, with its wide range of terrestrial, wetland, estuarine, lake, coastal and marine environments, is substantially unmodified by people and their effects. Having a total area of 289 376 ha, the Park is large enough to survive as a natural area and to maintain genetic diversity even though there are outside influences. Within the Park are a remarkable concentration and range of features, and, together with the full complement of plant and animal species, these constitute an area which is better than all other natural areas in this geographical location on the African continent. Hydrological threats to the wetland systems as well as the threat posed by infestations of alien plant species have been recognized and are discussed in this nomination (section 5).

2.4 Criteria under which inscription is proposed including justification

It is contended that the Park satisfies all four criteria required for listing as a World Heritage Site (Natural Property).

2.4.1 Criterion 1

The nominated properties should be outstanding examples representing *major stages of earth's history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features*. This category would include sites **where evidence representing the major "eras" of biological evolution** such as "the age of reptiles" occur and where the development of the planet's biological diversity can be demonstrated and **others where the effects of important evolutionary periods, such as the "ice age" when early man and his environment underwent major changes, upon the physical and biological environment could be demonstrated**

In addition, the sites described should contain all or most of the key interrelated and interdependent elements in their natural relationships; for example, an "ice age" area should include the snow field, the glacier itself and samples of cutting patterns, deposition and colonization (e.g. striations, moraines, pioneer stages of plant succession, etc.); in the case of volcanoes, the magnetic series should be complete and all or most of the varieties of effusive rocks and types of eruptions be represented.

The Park landscape encompasses examples of major stages in the earth's evolutionary history. In particular, it represents the Mesozoic era from the middle Jurassic and Cretaceous periods, and the Cenozoic era from the Miocene to Pliocene periods. Quaternary formations are also well-developed, e.g. the high sand-dune cordon which formed during the Holocene epoch. The evolutionary geological history represents the 180 million year period following the break-up of Gondwanaland. In this region, this was associated with volcanic activity and the formation of the Lebombo mountains (Jozini formation). This mountain range, part of which is situated within the Park boundaries, indicates the continental rift line.

During the Cretaceous period (between 140 and 160 million years B.P.), the igneous rocks were overlain by terrestrial and marine sediments in North-South zones parallel to the Lebombo mountains, and resulted in the Makatini formation (140-120 million years B.P.), the Mzini formation (112-91 million years B.P.) and the St Lucia formation (90-65 million years B.P.). All of these formations are well-preserved within the Park. Exposed rocks of four stages of the St Lucia formation (Upper Cretaceous) occur in the Park. These stages are the upper part of the Coniacian, the Santonian, the Campanian and part of the Maestrichtian.

The Cretaceous rocks were in turn overlain by sediments of the Maputaland group, of Neogene to Quaternary age, i.e. over the last 20 million years. This resulted in the Uloa formation of the Miocene period, calcarenite of the Pliocene period, the Port Durnford formation of the Pleistocene epoch, and the dune sands of the Holocene (the last 10000 years).

Geological sites of international significance are present in the Park. Along the western shore of Lake St Lucia, exposure of the sedimentary rocks of the St Lucia formation has occurred. These rocks are rich in well-preserved fossils of marine origin, and include giant ammonites and inoceramids, other bivalves, echinoids, gastropods, foraminifera and diverse microfossils. At Lister's point and Hell's Gate, exposure of the rich fossil-bearing rocks of the Uloa formation has occurred. These fossiliferous limestones contain more than a hundred different species of marine fauna, including the abundant zone fossil *Aequipecten uloa*, large bivalves such as

Hyotissa hyotis, gastropods such as *Tonna* and oyster beds, as well as brachiopods, barnacles, sponges and echinoderms. Of particular significance are the fossilized colonial and solitary coral forms preserved in growth position at Lister's Point.

The fossilized material provides a unique record of these palaeo-environments. Research projects aimed at providing systematic descriptions of the fauna commenced in 1929, and continue up to the present day. Recent studies have focused on the dating of Cretaceous deposits using a Strontium isotope. Information on the biogeographic affinities of the original component parts of Gondwanaland is becoming available. Of particular interest are the relationships between this area and Antarctica, southern Patagonia, Australia, Madagascar and southern India, as well as places in Europe, such as the Gosau Basin in Austria.

The fluvial, marine and aeolian processes initiated in the early Pleistocene, continue to the present day. These interrelated processes have formed the extensive coastal plain with its component features e.g. floodplains, swamps, pans, lakes and estuaries, as well as the high linear coastal dune cordon and associated beaches. The sedimentary processes, resulting from the transport and reworking of materials by water and wind, have built the floodplains and deltas, caused channel-switching and scouring of river channels, and developed pans, levees, dunes and beaches in the Park. At the same time, processes of erosion occur that include the dune-slumping at Perrier's rocks and Cape Vidal, and the breakdown of aeolianite (e.g. at Bat's Cave) and beach-rock (e.g. at Mission Rocks). All of these processes are event-driven. Major floods and coastal storms caused by tropical cyclones are of particular significance in this regard.

The input of sediments into the littoral zone, as a result of flood events, is the major source of material which contributes to the formation of the sand-bars which periodically close estuary mouths on this coast. These sandbars play an important role in determining the migration of fish and other marine and estuarine organisms between the lake and estuary systems and the sea. Inshore sediments are also transported from the sea by wave and wind action into the coastal dunes. Marine sediments being transported by the Agulhas current are also trapped by the submarine canyons on the continental shelf. These sediment export and trapping effects, and the absence of any large rivers from the Mfolozi River mouth to the Bay of Maputo, a distance of approximately 280 km, results in the remarkably clear waters necessary for the development of coral reefs.

The massive long-lived *Porites* coral domes also provide evidence of sedimentation events during the last 400 years since the Little Ice Age. Cores drilled in the corals expose banding caused by the incorporation into the coral lattice of enhanced humic acid concentrations, resulting from terrestrial run-off events. This provides a record of the periodicity and frequency of terrestrial run-off. Oxygen isotopes in the cores reveal sea-temperature changes over the same period. Together these data provide information on global climate trends and disturbance regimes.

The significance of the various geomorphic and physiographic features lies in the remarkably high environmental heterogeneity and biological diversity that is present within the confines of the Park. Contained within the designated area are all the interrelated, interdependent geological and physiographic features, and their

associated diverse, dynamic, event-driven environments, which have produced, and which support and maintain a rich and unique spectrum of species and communities.

2.4.2 Criterion 2

The property should comprise outstanding examples representing significant on-going *ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals*. As distant from the periods of the earth's development, this focuses upon ongoing processes in the development of communities of plants and animals; landforms and marine and fresh water bodies. This category would include for example (a) as geological processes, glaciation and volcanism, (b) as biological evolution, examples of biomes such as tropical rainforests, deserts and tundra (c) as interaction between man and his natural environment;

In addition, the sites should be of sufficient size and contain the necessary elements to demonstrate the key aspects of the processes that are essential for the long-term conservation of the ecosystems and the biological diversity they contain; for example, an area of tropical rain forest should include a certain amount of variation in elevation above sea level, changes in topography and soil types, river systems and naturally regenerating patches; similarly a coral reef should include, for example, seagrass, mangrove or other adjacent ecosystems that regulate nutrient and sediment inputs into the reef.

The Park is an outstanding example of one of the few, and possibly the only, remaining moist, coastal, subtropical natural area within the African Savanna Biome sufficiently large enough for the existing and original ecological and biological processes to operate without interference. The environmental heterogeneity and variability characteristic of the Maputaland coastal region in which the Park is situated, is expressed by the climate, where evaporation exceeds precipitation and wet and dry periods of several years duration occur, by the geology and soils which range from eutrophic to dystrophic conditions, and by the diversity of terrestrial, wetland, estuarine, coastal and marine physiographic features. Associated with this remarkable environmental heterogeneity and variability is an equally remarkable diversity in the natural biota. All the species of plants and animals and therefore all the elements that historically are known to have been present within the area of the Park, still occur with the exception of lion (*Panthera leo*), although lions have recently been established in the adjacent privately-owned Phinda Resource Reserve, and the elephant (*Loxodonta africana*) which is shortly to be re-established in the Mkuzi Game Reserve component of the Park. The high species richness of the Park is outstanding. This is due to several factors including the Park's regional position at the interface between tropical and subtropical African biota, the complexity of this transition, past speciation events within the Maputaland Centre of Endemism, many successful dispersal and establishment events of the past, and the wide diversity of habitats with their available rich resources.

It is considered that all the processes that have led to and influenced the evolution of the wide diversity of terrestrial, freshwater, estuarine and marine ecosystems, together with their component plants and animals, have not been significantly disrupted by external agents and are therefore still functioning in the Park. The ecological processes within the terrestrial and aquatic ecosystems in the Park, which control the population dynamics of the plants, invertebrates and vertebrates, and are usually present at both micro and macro scales, typically include such major

processes as primary production, input and cycling of nutrients, decomposition, inter- and intra-specific competition, disease, parasitism, herbivory, predation and migration. In addition, these systems are characterized by their biotic responses to natural disturbance processes that occur usually at a more local level, at different frequencies and intensities. Such disturbance processes include flooding, area-selective grazing and browsing and the burning of vegetation.

2.4.3 Criterion 3

The property should contain *superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance*, such as superlative examples of the most important ecosystems to man, natural features (for instance, rivers, mountains, waterfalls), spectacles presented by great concentrations of animals, sweeping vistas covered by natural vegetation and exceptional combinations of natural and cultural elements;

In addition the sites described should be of outstanding aesthetic value and include areas that are essential for maintaining the beauty of the site; for example, a site whose scenic values depend on a waterfall, should include adjacent catchment and downstream areas that are integrally linked to the maintenance of aesthetic qualities of the site.

The Park contains landscapes and features of exceptional natural beauty. Coastal and mainland areas outside of the Park have been substantially modified to the extent that they have lost their pristine wild character. In a Park that is so geographically and biotically diverse, wild, distinctive and spectacular, it is not possible to list all the features of high aesthetic importance and thus only a few superlative examples are given.

Superlative scenic vistas of significant natural beauty include:

- * The high forested coastal dune cordon, uninterrupted throughout the entire length of the Park, the wide deserted sandy beaches and Indian Ocean to the east and Lake St Lucia and associated mosaic of wetlands, grasslands and forests to the west;
- * The pristine, low-nutrient, coastal lakes of Bhangazi North and Bhangazi south and the vast St Lucia Lake, contrasting with their backdrop of high, forested, coastal dunes;
- * The rocky gorge of the Mkuzi river through the Lebombo Mountains having a geological antiquity dating back to Jurassic times;
- * The views from the Lebombo Mountains across the vast low-lying coastal plain with its diverse vegetation communities of grasslands, woodlands, swamps and forests showing no evidence of human occupation; and
- * The vast Mkuzi swamp with its expansive reedbeds and its pans covered in water lilies.

Other aesthetically beautiful features include various forest communities such as the Fig Forest in Mkuzi Game Reserve, gallery riverine forests, and the Mfabeni swamp forest.

The Park is known for having several superlative natural spectacles, including: -

- * The night-time nesting and subsequent hatching of Leatherback and Loggerhead turtles;
- * The migrations of whales, dolphins and whale sharks;
- * Concentrations of grazing and browsing ungulates, including impala, southern reedbuck, wildebeest, kudu, zebra, white rhinoceros and black rhinoceros;
- * Herds of hippopotamus in the water or on the reed banks of Lake St Lucia;
- * The unspoilt coral reefs with their spectacular, brightly coloured life forms;
- * Displays of feeding flamingos, pelicans, waders, and other waterfowl;
- * Breeding colonies of pelicans, yellow-billed storks, herons, Caspian terns, spoonbills and Redwinged pratincoles; and
- * The basking and nesting sites of the Nile crocodile.

Two remarkable phenomena require special mention. Linked to the climatic cycle of a period of wet years followed by a dry period of years, salinity states within Lake St Lucia respond accordingly, ranging from freshwater to hypersaline conditions. With this change in the aquatic environment, there is a corresponding shift in the biodiversity of the system. Under freshwater to low salinity states, submerged macrophytes increase, attracting large numbers of ducks and other waterfowl. During medium salinity states, populations of benthic organisms increase and fish, fish-eating birds and crocodile populations expand. During high salinity states both phytoplankton and zooplankton increase attracting large concentration of feeding flamingos (Taylor, 1993).

The second phenomenon concerns the already mentioned, remarkable range in wetland types present within the confines of the Park.

The Park is widely recognised for its environmental and biological diversity. Many professional and lay people in South Africa, and in many other countries of the world, regard the area as having a special significance for the conservation of this biodiversity at all scales including ecosystems. Arising from the St Lucia Mining environmental impact assessment, and after verbal evidence had been led, was the finding by the Review Panel, chaired by a former Supreme Court judge, that a sense of the Greater St Lucia Wetland Park as an especially precious place was not only expressed by scholars and conservationists, and others of Western orientation, but is felt possibly even more strongly by people who are indigenous to the area. The special natural qualities of the St Lucia wilderness area were mentioned, particularly its healing and calming effect on people traumatised by violence. The Review Panel in its summing-up stated that the Park is a very special asset for the nation and that there was no substitute. This supports our view that the Park, its biodiversity and unique complex ecosystems which it contains, are of universal value to mankind.

The Park is managed by a single nature conservation agency, the KwaZulu-Natal Nature Conservation Service, which has the capacity and capability and a proven track record that goes back over a period of 100 years. Bordering on the Park and particularly at Mkuzi Game Reserve and near the Park's western boundary, are buffer areas comprising a number of privately-owned properties having nature conservation, or other compatible land use practices. These include areas such as the Phinda Resource Reserve (15 313 ha) and other private nature reserves, game ranches or properties registered as South African Natural Heritage Sites by the Department of Environmental Affairs. Many of these private properties have, in collaboration with the KwaZulu-Natal Nature Conservation Service, established Biosphere Reserves, e.g. the Southern Maputaland Biosphere Reserve and the Pongolapoort Biosphere Reserve.

2.4.4 Criterion 4

The property should 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.* This category would include those ecosystems in which concentrations of plants and animals of universal interest and significance are found.

In addition, the sites described should contain habitats for maintaining the most diverse fauna and flora characteristic of the biogeographic province and ecosystems under consideration; for example, a tropical savannah should include a complete assemblage of co-evolved herbivores and plants; an island ecosystem should include habitats for maintaining endemic biota; a site containing wide-ranging species should be large enough to include the most critical habitats essential to ensure the survival of viable populations of those species; for an area containing migrating species, seasonal breeding and nesting sites, and routes of migration, wherever they are located, should be adequately protected, international conventions, e.g. the Conservation of Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar Convention), for ensuring the protection of habitats of migrating species of waterfowl, and other multi and bilateral agreements could provide this assurance.

The diversity of habitats contained within the Park is outstanding. The range in habitat diversity is from the sandy and rocky terrestrial environment with its various types of grasslands, thickets, woodlands and forests, to the saline and fresh water (mesotrophic to oligotrophic) wetlands and their wide range of swamps, grasslands, salt marsh, mangroves, swamp forests and riparian forest habitats, to the marine habitats, with sandy and rocky shores and beaches, the continental shelf and associated reefs and canyons. Four of these habitats are considered to be of global conservation significance. These are :

- * The nesting beaches for Leatherback and Loggerhead turtles;
- * The woodlands and thicket areas for the Black rhinoceros;
- * The dry sand forest/bushland areas having an exceptionally high species richness; and
- * The diversity of wetland habitat types.

Found within these habitats is a remarkable richness of plant and animal species. Species known to be present in the Park are listed in Schedules 1 to 13 and the total

number of species in the various taxonomic groups is given in Table 2. Knowledge of many taxonomic groups occurring in the Park is poor, particularly lower plants and invertebrate groups. However, those taxonomic groups that have been researched clearly indicate the universal nature of the species richness contained in this area. It is likely that the biotic communities contain all or most of their component species, with the exception of lion and elephant, which are the subject of current re-establishment programmes.

TABLE 2 Known species richness in selected taxonomic groups

TAXONOMIC GROUP	NUMBER OF SPECIES
Plants	
Seed plants (Schedule 1)	2180
Seaweeds (Schedule 2)	325
Invertebrates	
Sponges	14
Corals	129
Butterflies (Schedule 3)	196
Tabanids	64
Dragonflies	52
Cetonids	58
Dungbeetles (Schedule 4)	139
Wasps (hole nesting) (Schedule 5)	27
Benthic amphipods	115
Isopods	76
Terrestrial molluscs (Schedule 6)	41
Marine molluscs	812
Vertebrates	
Freshwater fish (Schedule 7)	55
Marine fish (Schedule 8)	991
Estuarine fish (Schedule 9)	212
Amphibians (Schedule 10)	50
Reptiles (Schedule 11)	109
Birds (Schedule 12)	521

Terrestrial mammals } (Schedule 13)	97
Marine mammals }	32

Within the diversity of habitats contained in the Park are those supporting populations of rare and endangered species. The overall number of species for the various groups of international and national conservation importance are given in Table 3 and the various species are listed in Schedule 14.

TABLE 3 Number of species of international and national conservation importance

Taxonomic Group	List of threatened species		Species listed by CITES
	International	National	
Plants	-	39	8
Molluscs	3	-	-
Freshwater fish	6	16	-
Amphibians	-	2	-
Reptiles	6	20	16
Birds	-	62	73
Terrestrial mammals	1	22	18
Marine mammals	32	-	32
TOTAL	48	161	147

Viable populations of all the listed threatened national and internationally important terrestrial and freshwater groups breed successfully in the Park. Internationally threatened species include the Black rhinoceros, Nile crocodile, six species of freshwater fish. Among the internationally listed threatened marine species, a total of 40 species, populations breeding within the Park include the bottlenose, humpback and spinner dolphin, leatherback and loggerhead turtles, and three species of mollusc. The remaining 32 species make use of the Park for feeding, or during migrations to breeding areas elsewhere.

Population sizes, particularly of all resident species in the Park, are believed to be sufficiently large and heterogeneous to ensure their genetic integrity. Also management has paid attention to ensuring that re-establishment programmes do not result in genetic contamination.

Although endemism is not a major feature of this biota, there are significant

numbers of either South African, KwaZulu-Natal, or Park endemic species (Schedule 15). The Park is located within the Maputaland centre of endemism and contains 46 such plant species. In addition there are six fish, ten amphibians, 20 reptiles, four birds, five mammals and ten terrestrial mollusc species recorded for the Park that are listed as South African endemics. Within the Park itself, nine species or sub-species have been listed as endemics.

For the various component areas of the Park, management plans have either been adopted or are at an advanced stage of preparation. Submitted with this nomination proposal are examples of two of the management plans for the Park (Appendices 4 and 5). Management programmes undertaken by staff over the years have ensured the protection of the area through law enforcement, controlling access by people and the utilization of sustainable resources. In addition re-establishment programmes, control of alien species, and fire management programmes, and the dredging of the mouth of the St Lucia estuary, are implemented according to biologically based rules.

South Africa became a contracting party to the 'Convention on Wetlands of International Importance especially as Waterfowl Habitat (the Ramsar Convention) in 1975, and has honoured this commitment as 12 sites (2 659,58 km²) have been inscribed on the list of Wetlands of International Importance. Four of these sites, St Lucia system (155 000 ha), turtle beaches/coral reefs of Tongaland (39 500 ha), Lake Sibaya (7 750 ha) and Kosi system (8000 ha) have been designated and are included within the nominated property. In addition, South Africa has ratified a related international convention, the Convention on the Conservation of Migratory Species of Wild Animals (the Bonn Convention) which came into force in December 1991. This convention complements the Ramsar Convention as a large number of migratory species use the Park during their annual migrations. In 1995 South Africa ratified the Convention on Biological Diversity and has subsequently undertaken a process of consultation with stakeholders which resulted in the White Paper on the conservation and sustainable use of South Africa's biological diversity, published as a Government Gazette in July 1997. The KwaZulu-Natal Nature Conservation Service is presently formulating a strategy in order to fully comply with the provisions of this Convention.

3. DESCRIPTION

3.1 Description of Property

3.1.1 Physical formations and groups of outstanding universal value

(i) Climate

The Park has a subtropical climate with warm, moist summers (mean annual temperatures exceed 21°C), and mild dry winters. The Agulhas current exerts a significant warming influence. There is an east-west climatic gradient within the Park, with the coast experiencing moist, subtropical conditions and high precipitation relative to the area inland which is moderately dry and subtropical. Rainfall at the coast varies from 1 200 to 1 300 mm per annum, with 60% of the rainfall in summer (November to March) and the remainder in winter (May to September). Rainfall is temporally and spatially highly variable in the Park. Episodic large scale floods occasionally occur, caused by tropical cyclones moving down the Mozambique Channel. Normal floods are usually due to cut-off lows.

Evaporation rates are high, especially during the drier winter and early spring periods. The annual average evaporation in the coastal zone is approximately 1300 mm, ranging from 160 mm in January, to 60 mm in June. In the drier interior, the annual average is 1660 mm, ranging from 190 mm in January, to about 80 mm in June. The prevailing regional winds tend to be parallel to the coast, blowing from the north-east or from the south-west (Goodman, 1990; Kelbe and Rawlins, 1992; Watkeys *et al.*, 1993).

(ii) Geological formations

The Lebombo mountains situated on the north-west boundary of the Park are located at the tectonic contact between two major Precambrian elements, the Kaapvaal Craton to the west (outside of the Park), comprising rocks of about 3 000 million years in age, and the concealed southerly extension of the north-south trending Mozambique belt to the east and comprising the area of the Park, estimated to be about 550 million years old. The Lebombo zone of crustal tension, extension and warping represents the western faulted monoclinical margin of a major graben, which developed in response to an early period of active rifting and tectonism in Gondwana.

The rifting of Gondwana and formation of the southern continents was accompanied by volcanic eruptions. Four different volcanic events took place at the continental margin during the Jurassic period over a period of about 70 million years. The last two consisted initially of a massive eruption of acid volcanic rocks (the Jozini Formation of the Jurassic Lebombo Group), followed by the final eruption of an overlying succession of conglomerates, pyroclastics, lavas and intrusions of syenite of the Bumbeni Complex during the Early Cretaceous (135 million years B.P.). These upwellings of lava in the immediate vicinity of the rift line indicate the general trend of the continental rift. They were followed by tectonism and a long period of erosion,

which resulted in the formation of the present Lebombo Mountains, which indicate the general location of the continental rift line.

The Lebombo Mountains were thus formed during the break up of Gondwana, with the extrusion of volcanic lava along the fracture zone. The oldest rocks exposed are the Jozini Formation rhyolites that were extruded about 180 million years B.P. The rhyolites and basalts of the Lebombo Mountains are more resistant to erosion than surrounding softer sediments (Wolmerans and Saggerson, 1988).

These igneous rocks are unconformably overlain by terrestrial and marine sediments of the Zululand Group, which comprise three formations exposed in north-south striking zones parallel to the eastern footslopes of the Lebombo Mountains. The first of these was the lower Cretaceous Makatini Formation (120 - 140 million years ago). The deposit consists of non-marine, fluvial coarse sandstone and conglomerate. Interfringing with these are sandy silt and sandy shelly limestone and concretions which grade upwards into shallow marine clays and sands. The overlying Mzinene Formation deposited between 112 to 91 million years ago consists of shallow marine silts and sands which are glauconitic with sandy and shelly concretions. The St Lucia Formation is the youngest (90 to 65 million years ago) and comprises buff and greenish grey glauconitic silts and fine sands.

The sedimentary rocks of the St Lucia Formation are rich in fossil remains, including ammonites up to a metre in diameter, bivalves, gastropods, echinoids and foraminifera, and are exposed over extensive areas. The sediments have a shallow dip towards the east, thus the oldest rocks are exposed in the west in False Bay, and the youngest along the Western Shores of Lake St Lucia. The exposed rocks consist of the upper part of the Coniacian Stage, the entire Santonian and Campanian and part of the Maestrichtian Stages (Kennedy and Klinger, 1990).

The Cretaceous rocks are overlain by the Maputaland Group sedimentary rocks of Neogene and Quaternary age, in the form of relict beach-dune ridges which record a succession of depositional events related to Neogene and Pleistocene sea level fluctuations. Cretaceous rocks in the area are overlain by Neogene (Late Miocene) coquina and sandstone, known as Uloa Formation ("Pecten beds"). The two best known outcrops occur at Hell's Gate in the north and Uloa in the south (outside of the Park). Over 100 different species of fossil marine fauna have been identified. One of the most common species is pecten, i.e. the zone fossil *Aequipecten uloa*. Fossil teeth of several shark species including the giant shark *Carcharodon megalodon* have also been found. This species was apparently abundant in these warm waters, and reached lengths of up to 15 m (Davies, 1964).

At Lister's Point and Picnic Point, exposures of False Bay Coral Limestone Member sediments incorporate fossilized colonial and solitary coral forms (some in growth position). These were hermatypic (reef-building) corals which grew under tropical conditions on a bioherm during a high sea level stand of 5 m above present mean sea level about 125 000 years ago. At this time False Bay was an open marine embayment. The fossil corals have tentatively been identified as *Favia*, *Favites*, *Porites*, *Galaxea* and *Goniapora* spp. A variety of fossil molluscs are present including large bivalves such as *Hyotissa hyotis* (23 cm in length) and *Tridacna* sp., large specimens of the gastropod *Tonna*, and oyster beds. Other fossil organisms

were branchiopods, barnacles, sponges and echinoderms (Ramsay, *pers.comm.*).

Pleistocene sediments form a thin veneer over the Neogene and Cretaceous rocks. These consist of poorly exposed fossiliferous Port Durnford Formation sediments, which consist of mudstone, lignitic clay, sand and coals, laid down about 120 000 yrs B.P. These are largely covered by unconsolidated dune sands. During the early part of the Holocene, the Flandrian transgression, which reached its peak about 500 0 years ago, caused erosion of the coastal dune barrier. During this time, redistribution of the terrestrial sand cover took place (Watkeys *et al.*, 1993).

(iii) Physiographic formations

These comprise a long flat coastal plain with associated lakes and pans, interspersed with relict dune cordons. To the west the coastal plain abuts the rugged linear mountain range and to the east, the coastal plain is separated from the long linear shoreline by a large continuous barrier dune complex. The easternmost land type consists of an offshore, shallow continental shelf.

Three major contiguous geomorphic units, the Lebombo Mountains, coastal plain and the continental shelf, are present within the Park.

Lebombo Mountains

The Lebombo Mountains, formed by resistant Jozini rhyolites, occur as a north-south trending undulating plateau at 300 m to 600 m elevation, bounded by a steep western scarp face with a gentle dip-slope to the east. Within the range there are a number of smaller west-facing scarps. These mountains are at their widest (13 km) and highest (over 700 m) to the north of the Park. Incised across this range are a number of steep valleys with generally angular floors with small areas of alluvium such as the Mkuze and Msunduze rivers within the Park. The section of the Lebombo Mountains within the Park are the less precipitous eastern slopes. The highest point is Khombe Peak (474 m). The Mkuze river meanders through these mountains initially in a steeply-sided gorge which becomes less precipitous as it emerges through the eastern foothills. The river course is superimposed across the resistant rhyolitic lavas by the lowering of the base level caused by the eustatic fall in sea level, at a rate of approximately one metre every 150 000 years, during the Neogene period of marine regression.

Coastal Plain

The coastal plain represents the depositional lowlands for the large rivers. The smaller streams of the Lebombo Mountains continue to supply coarse, immature material. For the purpose of this discussion the coastal plain is subdivided into five component terrestrial and aquatic landscape units (Watkeys *et al.*, 1993), all of which are present in the Park. These are:

- * the gently undulating terrain at the base of the Lebombo Mountains;
- * sandy ridges;
- * coastal lake systems;
- * coastal dunes; and

* river - related systems.

Weathering and erosion of the early Cretaceous sediments at the base of the Lebombo Mountains have resulted in a gently undulating landform with moderate relief and drainage spacing. Upland sites in the west have lithic soils whilst such sites to the east are characterized by ferruginous soils. Low-lying areas in the west contain calcimorphic soils whereas such sites to the east have vertisols.

Following the break-up of Gondwana, the southern African subcontinent underwent a series of uplifts. During the Quaternary period, the coastal plain underwent a long period of sedimentation and erosion, related to marine transgressions and regressions. During each regression, stratified marine deposits were re-worked, eroded and redistributed by marine and sub-aerial agents to form a series of prominent north-south orientated sandy dune ridges which are a conspicuous feature of this landform of very low relief. Calcimorphic clay to sandy clay loam soils predominate with valley floors having higher proportions of clay and vertisols being fairly common and dominant in some areas. (Watkeys *et al.*, 1993).

Two types of coastal lake systems are present, as either estuarine-linked lakes (St Lucia and Kosi), or fresh water lakes (Sibayi, Bhangazi North, Bhangazi South, Ngobozeleni). Lake St Lucia is the largest estuarine system of the African continent being approximately 36 826 ha in extent. It is a shallow system having an average depth of less than one metre. Water in Lake St Lucia is predominantly saline and only the extreme upper sections and the mouths of the feeder rivers are fresh water when inputs are high. Under dry or drought conditions, salinity levels rise and may result in very high levels being recorded in the upper sections of the system.

Lake St Lucia obtains its freshwater supplies from five river systems. These are the Mkuze (catchment c. 6 000 sq km²), Hluhluwe (catchment c. 1 000 km²), Mzinene (catchment c. 800 km²), Mpate (catchment c. 65 km²) and Nyalazi (catchment c. 700 km²). The major portions of these catchments lie outside the boundaries of the Park. The Mfolozi River (catchment c. 10 000 km²) formerly had a common mouth with the St Lucia estuary.

The palaeo-channels were last scoured in the late Pleistocene during the Last Glacial Maximum (16 000 - 18 000 years B.P.), by rejuvenation of the lower courses of the coastal rivers. The post-glacial transgression (end-Pleistocene to Holocene times) of the shoreline to its present position decreased river gradients and reduced their ability to maintain an open outlet to the sea. Only the largest rivers and estuaries such as the Mfolozi river and St Lucia maintained a semi-permanent outlet. Smaller rivers such as the Mkuze became blocked by littoral and aeolian processes and were permanently sealed by vegetation and the dune barrier. The impounded waters of Lake St Lucia rose well above present mean sea-level and flooded low-lying swamps and inter-dune depressions both north and south of the lake. Eventually the enlarged lake waters joined to enter the sea as a combined estuary mouth located where the present St Lucia estuary mouth is now situated (Wright, 1990).

The extensive basin of the Lake was formed during Pleistocene times. Feeder rivers developed deeply incised channels in the Cretaceous bedrock reaching 40 m below

present sea level. The St Lucia estuary indicates appreciable down-cutting during rejuvenation caused by several Tertiary marine regressions. This down-cutting was followed by erratic Holocene sedimentation. Radiometric dating of material retrieved from cores discloses that the palaeo-valley infills occurred after the last glacial maximum some 18000 - 16000 years ago. However, localised remnants of Pleistocene material were also revealed on the floor of the channel.

During glacial periods when sea levels had regressed, the present-day False Bay was a system of valleys for the Hluhluwe, Nyalazi and Mzinene Rivers, the courses of which had been diverted by barrier spits and coastal barrier dunes to a common course through the present Hell's Gate. This took place during the Weichselian marine regression, that followed the last glacial maximum, when mean sea level stood at some 120 m below present sea level.

The Flandrian marine transgression which followed the last glacial maximum resulted in the mouths of the Mfolozi and Mkuze Rivers becoming drowned (developed into lagoons). The St Lucia lagoon is estimated to have covered an area of over 900 km², and that of the Mfolozi lagoon a further 250 km². Together, these formed a single water body estimated to have been about 1165 km² in area, 112 km long and over 35 m deep in places. The lower portions of the valleys have remained as open water because submergence rates exceed those of sedimentation. The present Mkuze swamps were formed by sedimentation of the upper reaches of the drowned valley of the palaeo-lagoon. The Mfolozi swamps had a similar origin, but the palaeo-lagoon was transformed into a wetland due to the input of sediments transported by the Mfolozi River.

Since the 1930's, catchment degradation and the channelling of the Mfolozi Floodplain led to sedimentation of the combined St Lucia/Mfolozi estuary mouth, causing the mouth to close from April 1951 to April 1956 (Hill, 1975; Orme, 1990). A separate mouth for the Mfolozi river was constructed to the south of St Lucia estuary in 1952 and the mouth of the St Lucia estuary was finally opened in 1956. A management programme for the operation of a dredger that maintains open mouth conditions of the St Lucia estuary, as determined by nature-based operating rules, has been implemented.

The Lake Kosi system comprises a south to north series of lakes connected to each other by narrow shallow channels, these are: Lakes Manzamnyama, Kosi (Nhlangeni), Mpungwini and Kosi Bay (estuary). There are no large rivers that enter the system. The lakes are fed by several streams that drain extensive swamp areas in the surrounding catchment. Nutrient and sediment input is therefore low, and the whole system is characterized by having a fine sandy substrate with little silt or mud. There is a salinity gradient from a fresh water state in the south to that of sea water in the estuary which has an almost permanently open mouth. The largest lake in the system has a maximum depth of 31 m and an area of 37 km². During drought periods salinities are known to rise as a result of inflow of sea water and high evaporation. However, hypersaline conditions have not been recorded (Begg, 1980).

The freshwater lakes, Sibayi, Bhangazi North and Bhangazi South, are located in areas of low relief in large depressions in close vicinity to, and on the landward side of the coastal dune barrier. The lakes receive some of their water supplies from

relatively small catchments. Replenishment is largely from groundwater seepage. The lakes are nutrient-poor because of the predominantly sandy, leached nature of the substrate. Bhangazi South is at the northern extremity of the Mfabeni Depression, which is on average about eight metres above mean sea level, and drains southwards into Lake St Lucia via the Mfabeni depression and the Nkazana stream. It is approximately 250 ha in extent and has a mean depth of 4-5 m. Lakes Sibayi and Bhangazi North have no outlet (Jackson, 1992; Watkeys *et al.*, 1993). Unlike St Lucia, Lake Sibayi has a low surface area to volume ratio with a maximum depth of 43 m and a surface area that fluctuates from 59 to 77 km² according to years of drought or above average rainfall (Bruton, 1980).

The forested coastal dune system is a prominent landscape feature of the eastern edge of the Coastal Plain. This linear system consists of bi-directional parabolic dunes that have resulted from the effects of coast-parallel prevailing winds which formed ascending, accreting blowouts that have built the narrow, high dunes parallel to the coast, with some buttress-reversing barchanoids. Along the intertidal and infratidal zones, the coastline is characterized by long sandy beaches interspersed with rocky reefs of beachrock. The dunes are of late Pleistocene to Recent age having formed over the past 25000 years, and thus consist of superimposed sediment strata of different ages (Davies Lynn and Partners, 1992). Many of the large dunes exceed 160 m in height, the highest being the Mapelane dune (183 m).

Weathering of the dunes, with partial dissolution of the shell component and re-precipitation of pedogenic carbonate has led to lithification of both the dune system and the adjacent beaches. The resultant calcrete material is aeolianite (calcretized dune-rock) and beachrock (carbonate-cemented beach sand). The lithification of littoral sands into beachrock occurred contemporaneously with their deposition. The cementing process was triggered by the action of groundwater super-saturated by calcium carbonate, mixing with sea and/or rain water. Carbonate cementation is not necessarily restricted to the intertidal zone but may also occur in the supratidal zone moistened by sea spray. These rock types tend to form during sea level stillstands or during minor regressive events. Currently active geomorphic processes include dune building, dune slumping, aeolianite erosion, and beachrock erosion (Ramsay, 1991; Watkeys *et al.*, 1993; Ramsay, *in press*).

A number of river systems or portions thereof occur in the Park. The largest, the Mkuze and Mfolozi rivers, have the major portion of their catchment areas situated to the west in the hinterland and outside of the Park, with only a relatively small part of their lower reaches in the Park. Several smaller streams in the Lebombo Mountains are tributaries of the Mkuze river. The Hluhluwe, Mzinene and Nyalazi rivers are also important sources of fresh water for Lake St Lucia, all of which have most of their catchment areas lying outside of the Park. The catchments of the Mpate, Ngema, Nkazama rivers and the streams feeding into Lake Bhangazi North are situated on the coastal plain.

The rivers are seasonal, flowing during the wet summer months, and are reduced to isolated pools and subterranean seepage through bed sediments in the winter. In the mature-phase, meander-belt floodplain of the Mkuze River, river gradients are low and suspended sediment loads are generally high in comparison with bedloads. As a consequence, the river produces a distributary network of meander channels.

Levees are formed from stabilized sediments which are deposited as overbank deposits during flood events. With time, aggradation of the levees contain flood waters, permitting the water level to rise above the surrounding floodplain. These are stabilised by vegetation such as *Ficus sycomorus* gallery woodland. Breaching takes place during major flood events causing the meander system to shift its position. This process of avulsion has been responsible for the development of pans. Typically these pans represent swales in the Pleistocene dune sands that have been flooded as water backed up against the river levee that had closed the open end of the swale. A good example of a river delta is present at the mouth of the Hluhluwe river where it enters the lake (van Heerden, 1986; Watkeys *et al.*, 1993).

Continental Shelf

The two marine reserves of the Park, i.e. the Maputaland and St Lucia Marine Reserves, protect the Maputaland coastline from the Mozambique border to a point one kilometre south of Cape Vidal. This area contains a 155 km stretch of coastline and extends from the high water mark to a distance of three nautical miles (5.6 km) offshore and thus includes the entire continental shelf (Ramsay, 1991).

Within the Park, the Agulhas Current flows over the narrow continental shelf (2-4 km wide) that is characterized by coral reefs, submarine canyons and a steep gradient on the continental eastern slope of the shelf. Outcrops of beachrock and aeolianite, with or without a coral reef veneer, are the dominant consolidated lithology on the continental shelf. These carbonate-cemented rocks run parallel to the coast and extend semi-continuously from depths of -5 m to -95 m. They delineate late Pleistocene palaeo-coastline events.

Unconsolidated sediment present on the shelf is either shelf sand, composed mainly of terrigenous quartz grains, or bioclastic sediment which is partially derived from biogenic sources. Large sub-aqueous dunes are formed in the unconsolidated sediment at the outer-shelf due to the south flowing Agulhas Current acting as a sediment-conveyor. These dunes are a common feature at depths of -35 m to -70 m (Ramsay and Mason, 1990; Ramsay, 1991; Ramsay, *in press*).

Seven submarine canyons occur in the area. The origin of these canyons is not related to the position of modern river mouths but can probably be linked to palaeo-outlets of the Pongola and Mkuze river systems. The canyons were probably initiated by submarine slides on the steep continental slope, which, breaching the shelf, advanced shoreward during late Pleistocene regressions. Evidence of modern canyon growth has been noted during surveys of the canyon heads arising from wall slumps and small-scale debris flows. The canyons are supplied with large quantities of sand in the form of sub-aqueous dunes generated and transported by the Agulhas Current. On their arrival at the canyons, the sand cascades down the canyon thalweg causing erosion and downcutting of the floor and walls, thereby increasing the dimensions of the canyon. The canyons permit deep oceanic water and associated biota to reach a point close to the shore (Ramsay, 1991; Ramsay, *in press*).

(iv) Hydrology of Lake St Lucia

The hydrological regime of Lake St Lucia is dynamic, as the system has a high surface area to volume ratio and is thus very sensitive to the effects of evaporation. Principal inputs to the water budget are rainfall and streamflow. Water losses are occasioned by evaporation and discharge to the sea. The amount of water lost by evaporation exceeds the amount received from rainfall, even in years of average or above-average precipitation (Taylor, 1993).

The amount of fresh water received from streams and rivers is a major determinant of the salinity state of the overall system and its sub-components. During average to above-average rainfall seasons, the salinity gradient ranges from a fresh water state near river mouths to that of sea water (35 parts per thousand) in the estuary. In addition, the water level of the lake rises, resulting in a net discharge of water to the sea.

In periods of drought, more water is lost from evaporation than enters the lake from river-flow. Lake level falls below mean sea level, and should the mouth be open, a net inflow of sea water occurs and salinity levels rise. During extended periods of drought, the lake becomes hypersaline. Compartments of the lake system furthest from the estuary mouth may attain salinity levels up to three times greater than that of sea water. Under these conditions, the salinity gradient is reversed, with the relatively least-saline areas closer to the mouth. Hypersaline conditions have been recorded as occurring on average for about two years duration each decade.

Changes in spatial and temporal salinity levels exert major influences on the biota of the lake. Because each aquatic species has an individual salinity-tolerance level, the response to salinity changes is a continual flux of species population levels. Consequently the lake is a dynamic ecosystem which imposes a high degree of biodiversity, both in time and space (Taylor, 1993).

The possibility that the shallow nature of the lake is indicative of high levels of accelerated erosion in the catchments of the feeder river systems has been investigated. The results of a siltation-monitoring programme, operated for nearly thirty years, has given no indication of increased siltation rates or net accumulation of sediments. The suspended-solid loads of the inflowing larger rivers are therefore effectively trapped and retained in the swamp systems before the water enters the lake.

(v) Characteristics of the marine environment

The dominant oceanographic feature of the Park is the Agulhas Current. It is believed that the current forms off the northern South Africa/Mozambique coast, from the confluence of waters which follow complex paths in the Mozambique Channel and areas south of Madagascar. The Agulhas Current, recognised as one of the world's major currents, sweeps polewards with a core flow generally just offshore of the shelf break and thus markedly influences the waters on the shelf itself. Because of the narrow nature of the shelf, the Agulhas Current flows close inshore in a southerly to south-easterly direction where it attains velocities of 1.5 ms^{-1} .

Being of tropical origin, the current is warm, with mean sea temperature ranging from



Exposed sedimentary rocks of the St Lucia Formation (90-65 million years B.P.) are rich in well preserved fossils of marine origin including large ammonites, photographed here on the western shores of Lake St Lucia (*Photo by R.H. Taylor*).



A large nautiloid ammonite at an exposed fossil site on the Nibela Peninsula, Lake St Lucia (*Photo by R.H. Taylor*).



A bed of exposed ammonites on the western side of Lake St Lucia (*Photo by R.H. Taylor*).



An aerial view of the mouth of the St Lucia Estuary with the Mfolozi Estuary Mouth in the background. The large Mfolozi Swamps lie between these two systems (*Photo by R.H. Taylor*).



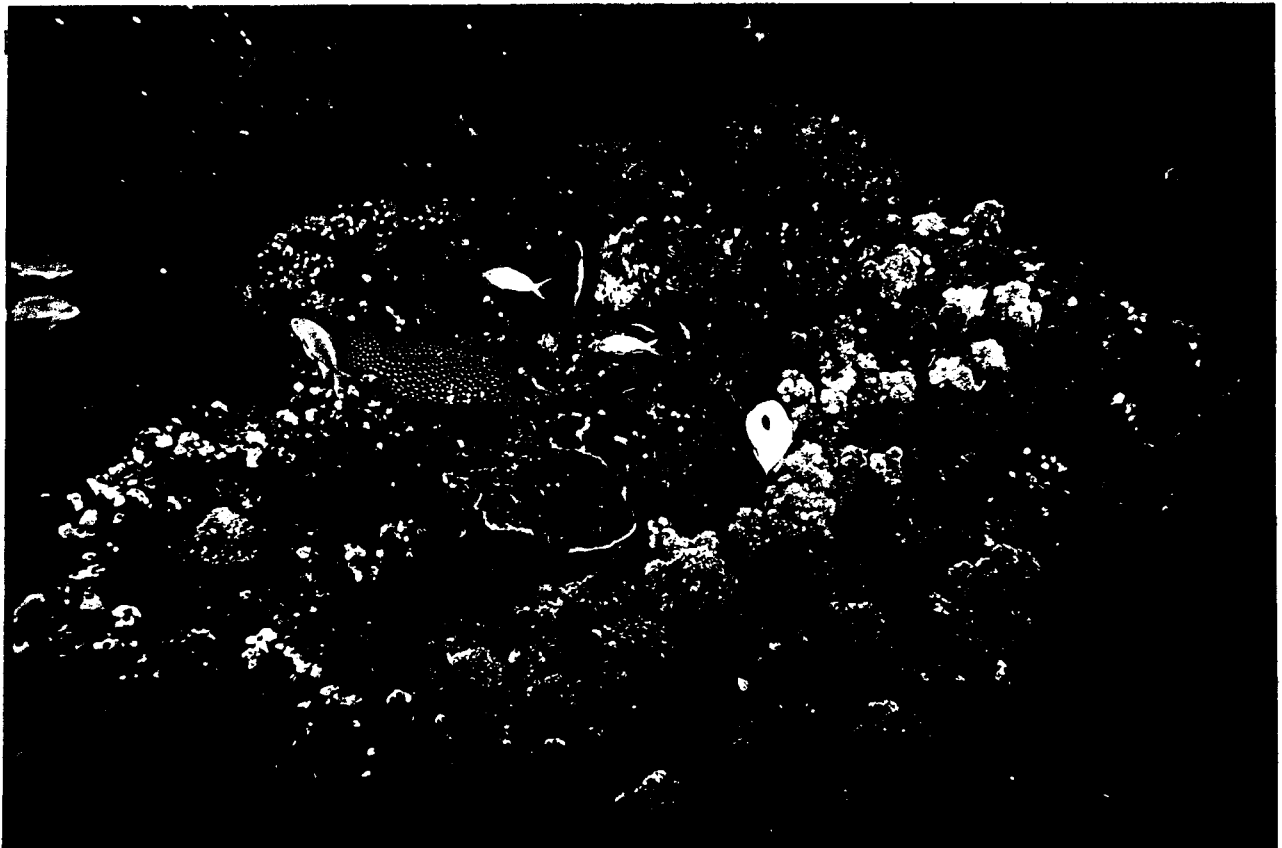
Extensive areas of beach rock occur at intertidal levels in the marine component of the Park. Here a group of people on a wilderness trail under the leadership of Natal Parks Board staff explore this coastal area *(Photo by R.H. Taylor).*



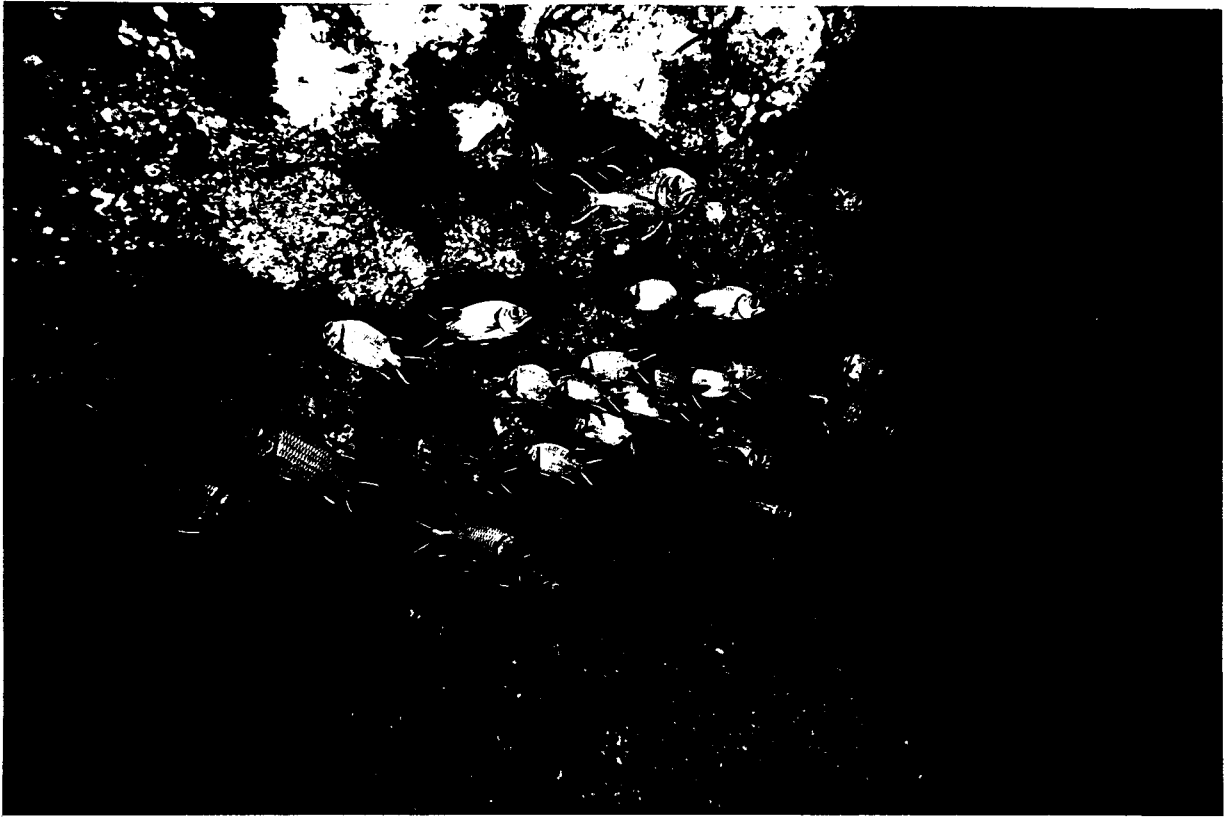
At Bat's cave the eroding beach rock formation underlies the high forested coastal dune *(Photo by R.H. Taylor).*



Coral formations on Two Mile Reef off Sodwana Bay grow directly on their late Pleistocene sandstone substrate (*Photo by Dennis King*).



The rich and abundant marine life associated with the coral reefs in the Park (*Photo by Dennis King*).



The coral inhabited reefs typical of a marginal belt range in depth from 8m to 35 m and in South Africa are almost entirely restricted to Kwa Zulu / Natal and the marine reserves of the Park
(Photo by Dennis King).



An aerial view of the coast within the north-eastern area of the Park showing the wide sandy beaches flanked by the high, forested coastal dune cordon and the undulating Maputaland plain to the west
(Photo by Trevor Barret).

28°C in summer, to 18°C in winter, and is also silt-free. The current is a primary determinant of the biodiversity in the coastal marine environment, and the climate of the adjacent terrestrial coastal strip (Ramsay, 1991; van der Elst, 1994).

The tidal range averages 2 metres, and the coast is therefore classified as being high microtidal. It is dominated by persistent high-energy waves and prevailing large-amplitude swells from the southeast (40% of the year) with northeasterly to easterly onshore swells prevailing for a further 40% of the time. The influence of the seasons on wave directional distributions is negligible. Subordinate low-amplitude, short-period, north-easterly swells are formed when north-easterly winds blow. Under these conditions the smaller north-easterly swell is superimposed on the south-easterly swell. Only when a north-easterly wind blows for a longer period, does it become the dominant swell direction (Schumann, 1988; Ramsay, *in press*).

3.1.2 Biological formations and groups of outstanding universal value

(i) Biogeographic importance of the region

The Park is located in the Maputaland region and lies at the interface between tropical and subtropical biota (Bruton & Cooper, 1980). The species pool (gamma diversity) is very rich largely due to its regional position, and the complexity of the transition between these biota, where communities occur in mosaics of different types with different floristic and faunistic affinities. The richness of this species pool is seen as being the result of a number of speciation events in the past, hence the high number of endemics, and a large number of successful dispersal and establishment events from adjacent faunas and floras. Another major determinant of the large species pool, and the complexity of the plant and animal assemblages, has been the high levels of environmental heterogeneity existing in the region. This has resulted from a highly variable spatial and temporal rainfall pattern, and the steep gradient of the edaphic environment. This varies over the full range of physical (texture and depth) and chemical (eutrophic to dystrophic) limits.

Since the area is transitional with respect to adjacent biotas, historical events are likely to have contributed to the penetration of linking species into the area, and regional mass effects contribute to the continued existence of these species in the region. At a more local level, disturbance has both enhanced and constrained diversity (alpha and beta diversity). Natural disturbances such as flooding, tree falls caused by winds and tornados, and area-selective grazing and browsing, have acted with different intensities and frequencies over the landscape and have served to enhance diversity. On the other hand, both man-induced and wild fires have both enhanced and constrained spatial heterogeneity, and hence have also influenced alpha and beta diversity.

(ii) Flora

Floristics

Phytogeographically, the Park is at the southern end of the Maputaland Centre (van Wyk, 1993), one of two clear foci of high endemism in White's Tongaland-Pondoland Regional Mosaic (White, 1983). The Maputaland Centre is bounded in the north by

the Limpopo River, in the west by the Le bombo Mountains, and in the south by the St Lucia estuary.

The flora of the Park is representative of the floristic region in which it lies. The Maputaland Centre has a high species richness with about 1800 plant species. A total of 2173 species have been recorded for the Park being 98% of the flora for the centre (Schedule 1). It is a highly diverse flora with 152 families and 734 genera present. Approximately 9 % of the flora of South Africa, and 31 % of the flora of the KwaZulu/Natal Province, is represented in the Park (Scott-Shaw, 1994).

The Park has a notable number of endemics. At least 168 species and infraspecific taxa are considered to be endemic or near-endemic to the Maputaland Centre (van Wyk, 1993). Of these, 44 (27%) are found in the Park while six species are Kwazulu/Natal endemics and three species are known only from the Park (see Schedule 15). As one of the few protected areas in the Maputaland Centre of Endemism, the Greater St Lucia Park contributes to the maintenance of populations of endemics in the sub-region, but at the southernmost extent of their distribution range.

Taxa of phytogeographical interest include the following:

- (i) *Helichryopsis septentrionale*, a Maputaland endemic and a monotypic genus is found in the Park;
- (ii) Four regional endemic genera, *Brachychloa*, *Ephippiocarpa*, *Helichryopsis* and *Inhambanella*, are represented in the Park;
- (iii) Some 136 species reach their southernmost limit of distribution in the Park;
- (iv) The endemic *Restio zuluensis* is remarkable in that it has few affinities with other Restionaceae to the north or to the south;
- (v) Two aquatic plants are of interest: *Wolffiella welwitschii*, a recently discovered freshwater endemic is the smallest flowering plant in southern Africa; and *Thallasodendron ciliata* is the only marine flowering plant found on the southern African coastline;
- (vi) A new species of a small grassland aloe with affinities to *Aloe parviflora* awaits description. It is endemic to the Park and is confined to the Eastern Shores area; and
- (vii) *Kalanchoe luciae* subsp. *luciae*, described recently, takes its name from the Park, and is endemic to the Park.

The Park is of great interest to the biologist for observing and studying plants, both novel in the region, and of taxonomic importance by being at the limit of their ranges. Several species also show considerable disjunction in their distribution. Species with the most remarkable disjunct distributions include *Scirpus nodosus* which is known from both within the Park and the southern Cape. The closest recorded occurrence of *Cordyla africana*, *Oxyanthus latifolius*, *Rothmannia fischeri*,

Halodule uninervis and *Thallasodendron cilliata* present in the south of the Park, is on the Mozambique border and further to the north. The nearest known occurrence of the orchid, *Vanilla roscheri* which is found at Lake Sibayi as an isolated population, is 140 km to the north at Inhaca Island.

The Park is not very well known botanically when compared to many other areas in South Africa. It is expected that as the flora becomes better documented so too will the phytogeography and threatened status of the rare species. Taxa which rate in the IUCN's proposed new categories of threat are *Encephalartos lebomboensis*, *E. ferox*, *E. ngoyanus* and *Warburgia salutaris* (vulnerable); *Polystachya zuluense* and *Pachycymbium ubomboense* (susceptible) (Scott-Shaw, 1994).

A total of 32 species are listed in the South Africa Red Data Book for Plants, and eight species are contained in Cites Appendices (Schedule 14).

Vegetation Types

The vegetation of the Park is exceptionally diverse, and consists of a mosaic of forest, thickets, woodlands, grassland and wetland types, the distribution of which is largely determined by topography, moisture regimes and edaphic conditions.

Wetland Types

Freshwater *Phragmites* and papyrus swamp

Poorly conserved elsewhere in South Africa, this community covers approximately 7000 ha in the Park. It occurs on organic and alluvial soil in the upper (freshwater) Mkuze swamps, and forms the largest wetland in any protected area in South Africa. Characteristic species are *Cyperus papyrus* and *Phragmites australis*.

Saline reed swamp

This community provides detritus and shelter for estuarine organisms and grows on saline alluvial soils. It is found on islands in Lake St Lucia and forms a narrow fringe zone around the lake. The characteristic species is *Phragmites mauritianus*.

Eleocharis (sedge) swamp

This swamp community is not conserved in any other South African protected area. It occurs principally in the Mfabeni Swamp and also in limited localities on the eastern and western shores of Lake St Lucia. It grows on organic soils. The characteristic species is *Eleocharis limosa*.

Salt marsh

Juncus (ncema) is a commercially important plant to Zulu people being used for weaving traditional sleeping mats. It is found on saline and freshwater wetland soils, along the margins of the lake and islands. Characteristic

species are *Sporobolus virginicus*, *Paspalum vaginatum*, *Juncus kraussii*, *Salicornia* spp., and *Ruppia maritima*.

Submerged macrophyte beds

A habitat rich in nutrients, it supports many fish and crustaceans, which are predated by a wide variety of water birds. It grows on saline lake-bottom soils. Characteristic species are *Potamogeton pectinatus*, *Ruppia cirrhosa*, and *Zostera capensis*.

Grassland Types

Hygrophilous grassland on sand

This is a grassland type which is poorly conserved in other protected areas in South Africa. It provides highly palatable grazing for many herbivore species. It is found on transported, sandy riverine soils. Characteristic species are *Acroceras macrum* and *Ischaemum arcuatum*.

High-lying grasslands on sand

An important habitat for herbivores which is poorly conserved elsewhere in South Africa. It is a fire-subclimax community, diverse in terms of species and life forms, and containing many species of shrubs, herbs, lianas and grasses. It occurs on well-drained regic sands of the coastal plain. Characteristic species are: *Aristida junciformis*, *Themeda triandra*, *Imperata cylindrica*, *Cymbopogon validus*, *Helichrysum kraussii*, *Diospyros villosa*, *Thesium* sp., *Cassytha filiformis* and *Smilax kraussiana*.

Palm veld

Palm veld is not conserved in any other protected area in South Africa. It is a fire-subclimax community, however excessive burning maintain palms in a stunted form. It is an important habitat for herbivores. Characteristic species are *Hyphaene coriacea*, *Phoenix reclinata* and grass species as above.

Echinochloa floodplain grassland

This grassland type is poorly conserved elsewhere in South Africa, being found on seasonally inundated floodplains of the larger rivers (Mkuze and Mfolozi). It provides highly palatable grazing for herbivores. Where it occurs outside of protected areas it is threatened by cultivation. Characteristic species are *Echinochloa pyramidalis*, *Eriochloa* spp., *Sorghum* spp., and various *Cyperus* species.

Low-lying grasslands on clay

A poorly conserved community elsewhere in South Africa, it provides highly palatable grazing for herbivores. This grassland occurs on low-lying, seasonally waterlogged clay soils adjacent to floodplains of the Mkuze and

Mzinene Rivers. Characteristic species are *Themeda triandra*, *Sehima galpinii* and *Cynodon dactylon*.

Lebombo grasslands

The Lebombo grasslands are a mixed, sour, fire-subclimax grassland, with relatively low carrying capacity for grazer species, growing on shallow rhyolitic lithosols. Characteristic species are *Themeda triandra*, *Cymbopogon excavatus*, *Heteropogon contortus*, *Digitaria* spp., *Aristida diffusa* and *Eragrostis racemosa*.

Open Woodlands

Lebombo broad-leafed open woodland

This is a mixed, sour, fire-subclimax community which provides good refuge for water-dependent ungulates in the vicinity of water supplies, but has a relatively low carrying capacity. It grows on residual rhyolitic soils. Characteristic species are *Themeda triandra*, *Tristachya* sp., *Digitaria eriantha*, *Elyonurus argenteus*, *Heteropogon contortus*, *Aristida* spp., *Combretum apiculatum*, *Ficus* spp. and *Pavetta edentula*.

Mixed *Acacia* / broadleaved open woodland

This community provides good grazing and browsing for herbivores and is found on seasonally wet duplex clay soils. Characteristic species are *Hyphaene coriacea*, *Ziziphus mucronata*, *Spirostachys africana*, *Sideroxylon inerme*, and *Themeda triandra*.

Mixed *Acacia* woodland

This woodland provides both good grazing and browsing for herbivores. Characteristic species are *Acacia nigrescens*, *A. gerrardii*, *A. tortilis*, *A. nilotica*, *Dichrostachys cinerea*, *Themeda triandra*, *Bothriochloa insculpta*, *Digitaria eriantha*, *Eragrostis* spp. and *Panicum* spp.

Closed Woodlands

Riverine woodland

Riverine woodland provides moderate quality grazing and browsing for herbivores and is of great importance for the stabilization of banks of feeder rivers to Lake St Lucia. Poorly conserved elsewhere in South Africa, it grows on the upper fertile alluvial terraces of the Mkuze and Msunduzi Rivers. Characteristic species are *Ficus sycomorus*, *Acacia xanthophloea*, *Rauvolfia caffra*, *Acacia schweinfurthii*, *Azima tetraantha*, *Panicum* spp., *Sporobolus* spp., and *Eriochloa* spp..

Mixed *Acacia* closed woodland

The woodland provides browsing and grazing for herbivores and is found on lower-lying drainage lines and older alluvial soils. Characteristic species are *Acacia tortilis*, *A. nilotica*, *A. borleae*, *Themeda triandra*, *Digitaria eriantha*, *Sporobolus nitens*, and *Bothriochloa insculpta*.

Acacia grandicornuta woodland

This community also provides good grazing and browsing for herbivores and is not conserved in any other protected area in South Africa. It is found on duplex soils in hollows between old coastal dunes in Mkuze Game Reserve. Characteristic species are *Acacia grandicornuta* and *Dactyloctenium australe*.

Broad-leafed woodland

This woodland provides moderate to high quality grazing and browsing for herbivores. It is conserved in only one other protected area in South Africa (Ndumo Game Reserve) and is widespread on red sands on old coastal dunes of Maputaland. Characteristic species are *Combretum molle*, *Ziziphus mucronata*, *Sclerocarya birrea* subsp. *caffra*, *Acacia burkei*, *Xeromphis obovata*, *X. rudis*, *Panicum maximum*, *Sporobolus pyramidalis*, and *Dactyloctenium australe*.

Terminalia / *Strychnos* woodland and scrub

This community provides good quality browsing but indifferent quality grazing and is poorly protected elsewhere in South Africa. It is widespread in lower Mkuze and the central portion of the Park, on yellow-brown to pale (pallid) white sandy soils. Characteristic species are *Terminalia sericea*, *Acacia burkei*, *Sclerocarya birrea* subsp. *caffra*, *Strychnos* spp, *Tabernaemontana elegans*, *Xeromphis obovata*, *Aristida congesta* and *Eragrostis pallens*.

Thickets

Mixed microphyllous / broad-leafed woodland and thicket

A poorly protected community elsewhere in South Africa, it is an important habitat for both black rhinoceros and suni. It provides good browsing but indifferent grazing for herbivores and occurs on poorly drained, low-lying vertisols in a mosaic of closed woodland surrounded by thicket. Characteristic species are *Spirostachys africana*, *Cassine aethiopica*, *C. transvaalensis*, *Sideroxylon inerme*, *Euclea divinorum*, *E. schimperii*, *E. undulata*, *Pappea capensis*, *Berchemia zeyheri*, *Dactyloctenium australe*, and *Enteropogon luderitzii*.

Coastal thicket on seaward-facing dune cordon slopes

This community differs from coastal dune forest in physiognomy, and in principal dominants, but otherwise there is little difference in structure and thus can be considered a floristic gradient of dune forest. The low habit is maintained by salt spray and exposure, mainly to strong winds and therefore

plays a vital role in protecting the slopes of the foredune. It is an important bird habitat which also provides browse for other herbivores. It grows on the steep/precipitous seaward-facing slopes (regic sands) of the dune cordon. Characteristic species are *Eugenia capensis*, *Brachylaena discolor*, *Euclea natalensis* subsp. *rotundifolia*, *Diospyros rotundifolia*, *Mimusops caffra*, *Chrysanthemoides monilifera*, *Apodytes dimidiata*, *Erythroxylum marginatum*, *Strelitzia nicolaii* and *Hibiscus tiliaceus*. Dune pioneers include *Scaevola thunbergii*, *Rhoicissus digitata*, *Cynanchum obtusifolia*, and *Ipomoea wightii*.

Forest types

Swamp forest

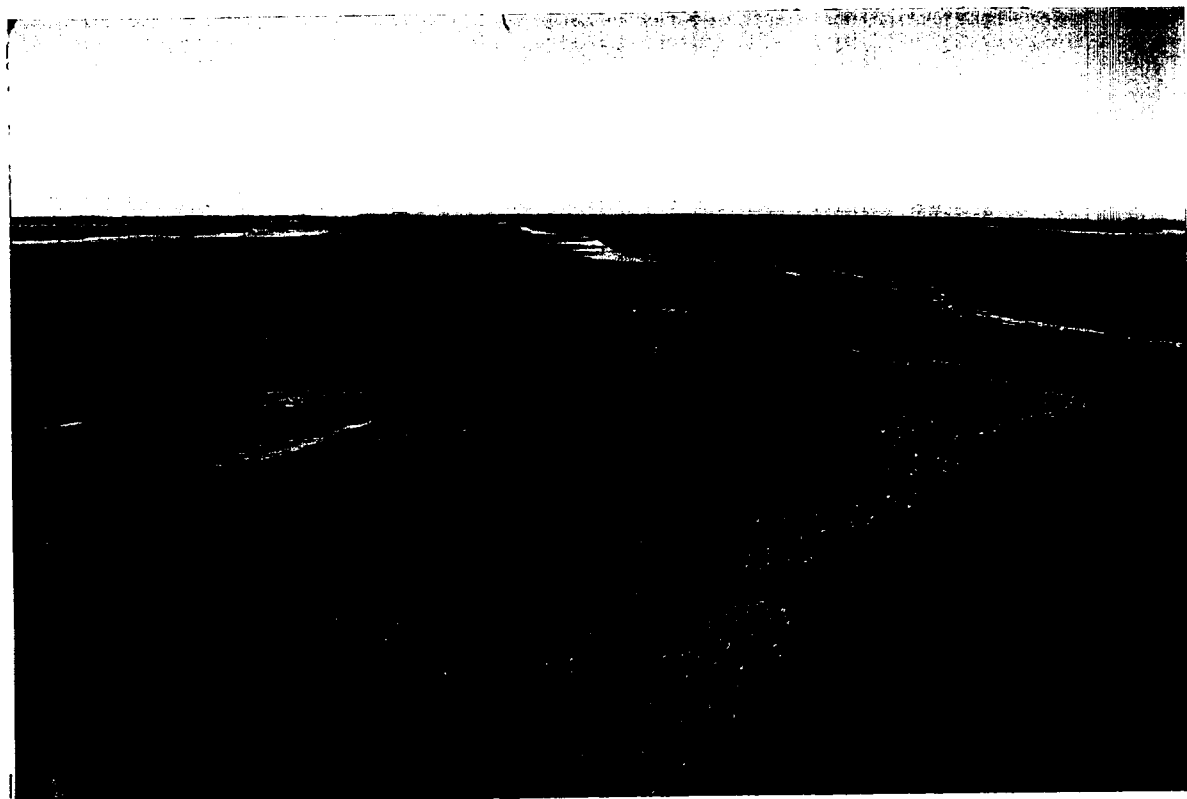
This community is extremely rare in South Africa with a total extent of approximately 4 843 ha. An estimated 64% (3 095 ha) of pristine swamp forest occurs in the Park. It plays a vital protective (filtration) role for wetlands. It provides habitat for many rare species, especially birds. It occurs in three sub-types, swamp forest (*Ficus trichopoda* as principal dominant), hygrophilous forest (*F. trichopoda* absent) and Barringtonia Forest (*Barringtonia racemosa* is principal dominant). Typically it is found on organic (Champagne Series) soils, in hypo-saline (freshwater) drainage lines and marshes around freshwater lakes, usually inundated with a low-flowing water after rains. Characteristic species are *Ficus trichopoda*, *Voacanga thouarsii*, *Syzygium cordatum*, *Barringtonia racemosa*, *Phoenix reclinata*, *Macaranga capensis*, *Bridelia micrantha*, *Psychotria capensis*, *Tarenna pavettoides*, *Psilotum nudum*, *Stenoclaena tenuifolia* and *Nephrolepis biserrata*.

Mangroves

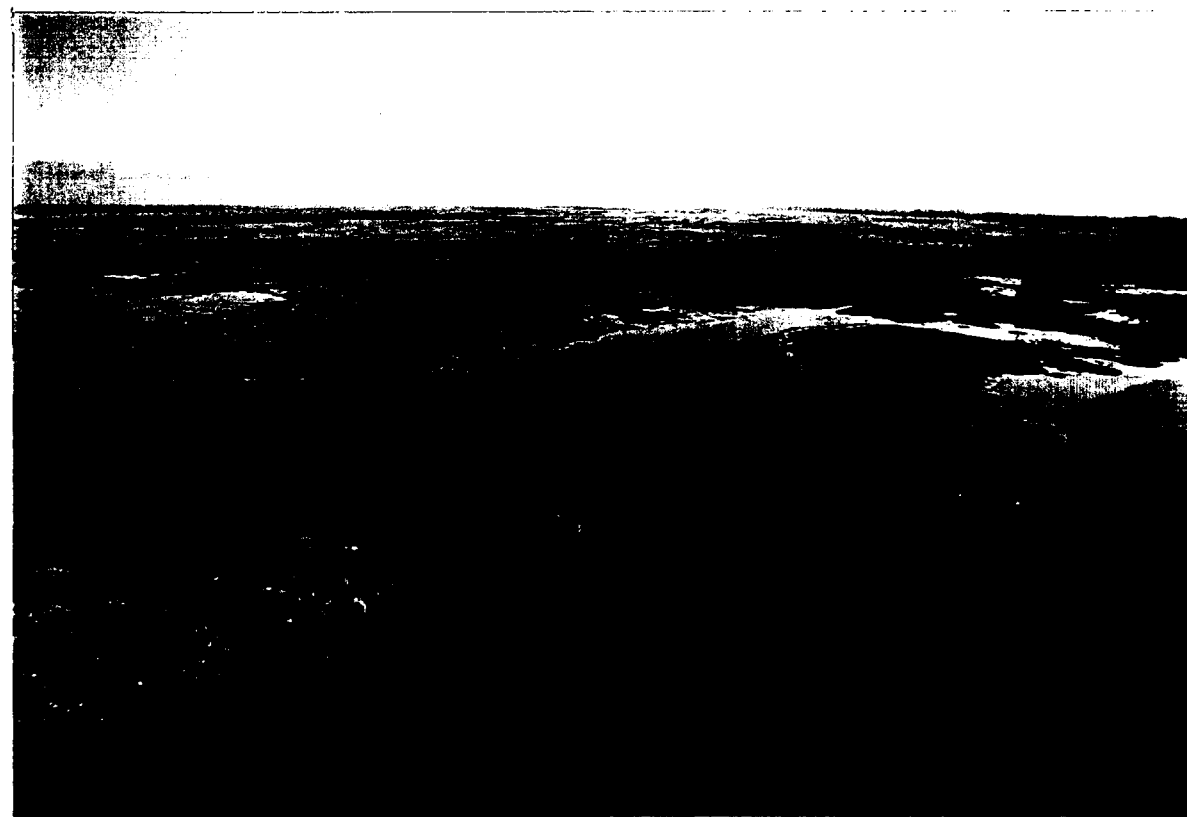
Mangroves provide habitat for a number of species that are confined to this habitat. It is conserved in only one other protected area in South Africa and is found growing in the intertidal zone of St Lucia estuary. Characteristic species are *Bruguiera gymnorhiza* and *Avicennia marina*.

Coastal dune forest

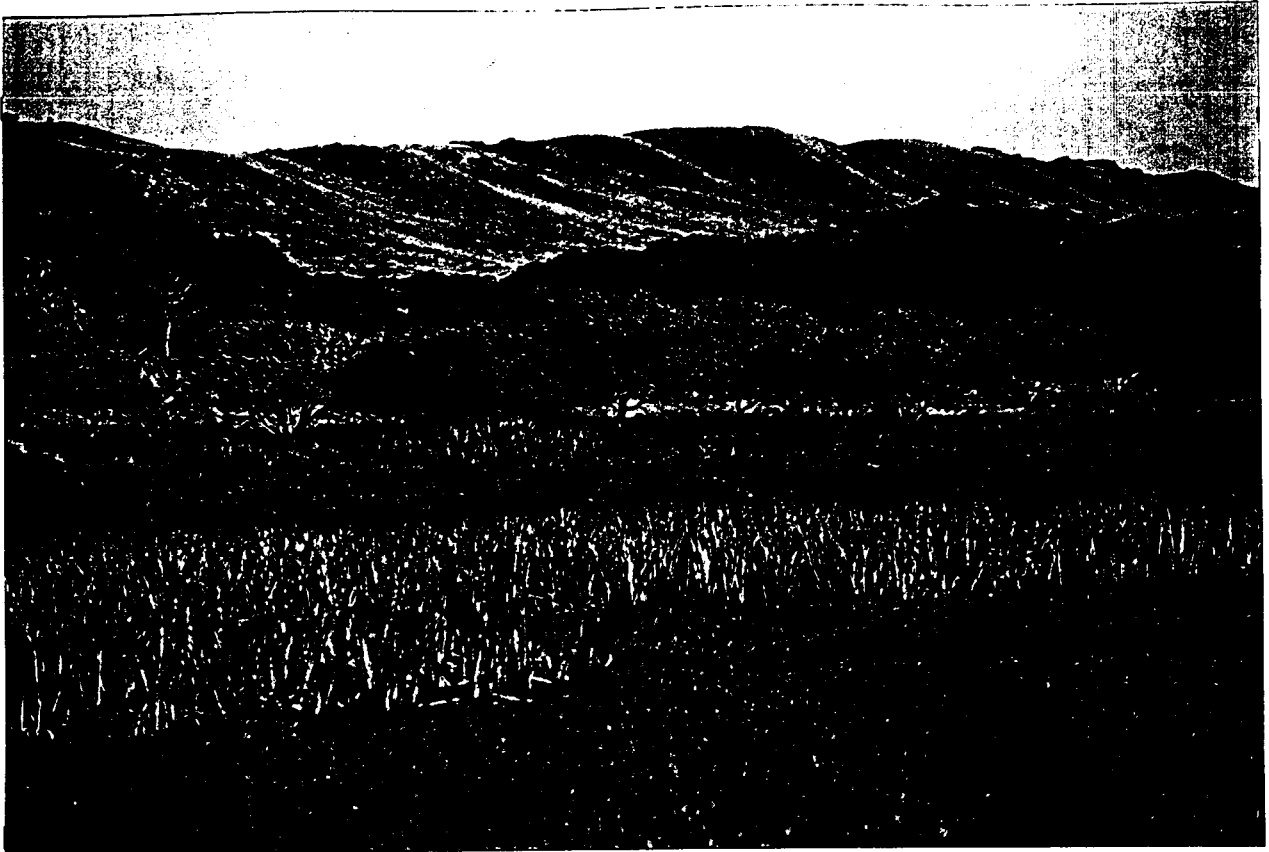
Coastal dune forest provides habitat for many specialised coastal forest bird, mammal and other faunal species and plays an important role in protecting the loose (regic) dune sands, especially the upper humic nutrient layer. It is a highly complex climax community of the coastal dune cordon where light rainfall occurs. Distinct floristic gradients occur across the dune cordon, and the community is accordingly rich in species. It may reach up to 30 m in height in protected sites, but is usually characterised by a dense shrub layer, and many lianes. Characteristic species are *Mimusops caffra*, *Grewia occidentalis*, *Psychotria capensis*, *Peddiea africana*, *Ficus burtt-davyi*, *Diospyros natalensis*, *D. rotundifolia*, *D. inhacaensis*, *Euclea natalensis*, *Apodytes dimidiata*, *Brachylaena discolor*, *Ziziphus mucronata*, *Carissa bispinosa*, *Dracaena hookeriana*, *Isoglossa woodii*, *Panicum deustum*, *Digitaria diversinervis*, *Tragia durbanensis* and *Sansevieria hyacinthoides*.



An aerial view of Lake St Lucia with the reed covered Fannies Island in the foreground and the closed woodland covered western shores of the lake to the west (Photo by R. de la Harpe).



An aerial view of the extensive swamps that extend northwards of Lake St Lucia (Photo by R. de la Harpe).



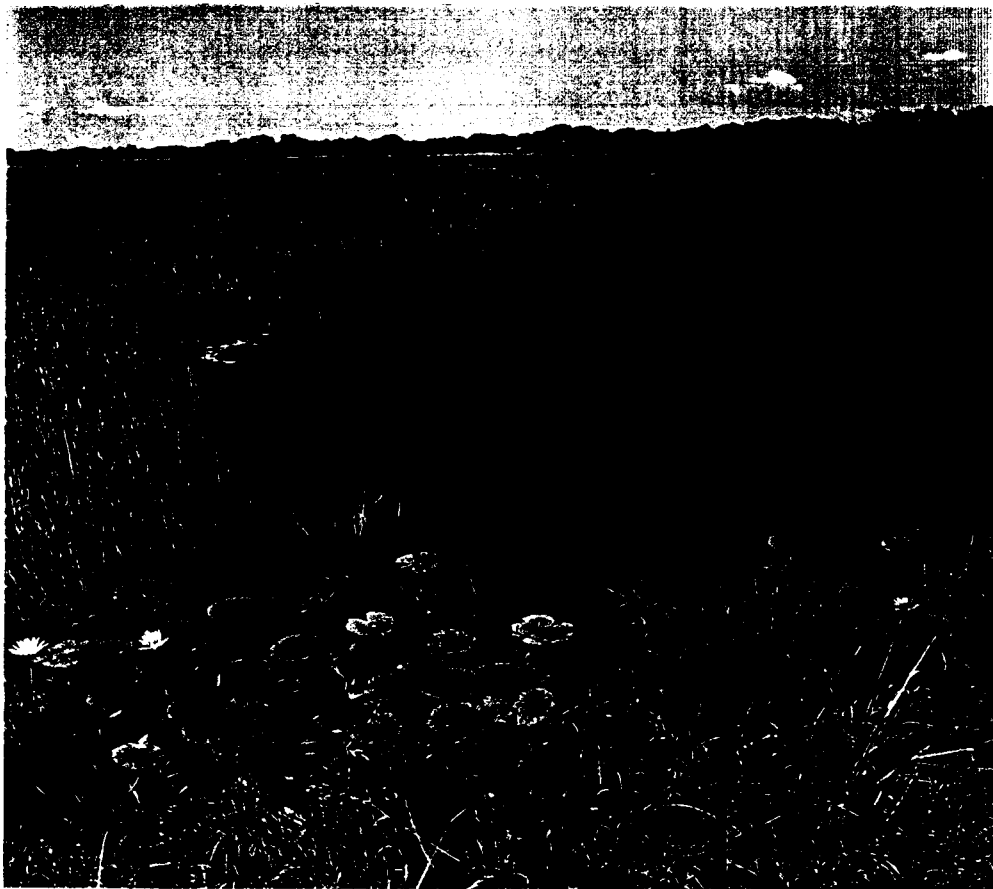
Sedge and hygrophilous grassland communities occur in the lower lying areas of the Eastern Shores interspersed between areas of Coastal Forest growing on relatively higher ground. Coastal grassland is present on the west facing slopes of the higher dunes in the background (*Photo by R.H. Taylor*).



High forested dunes at Cape Vidal rise steeply from the shores of Lake Bhangazi South, a fresh water system on the Eastern Shores of Lake St Lucia (*Photo by R. de la Harpe*).



Part of the Mfabeni Swamp on the Eastern Shores supporting a *Eleocharis limosa* sedge community. This swamp community is not conserved in any other South African protected area
(Photo by R. de la Harpe)



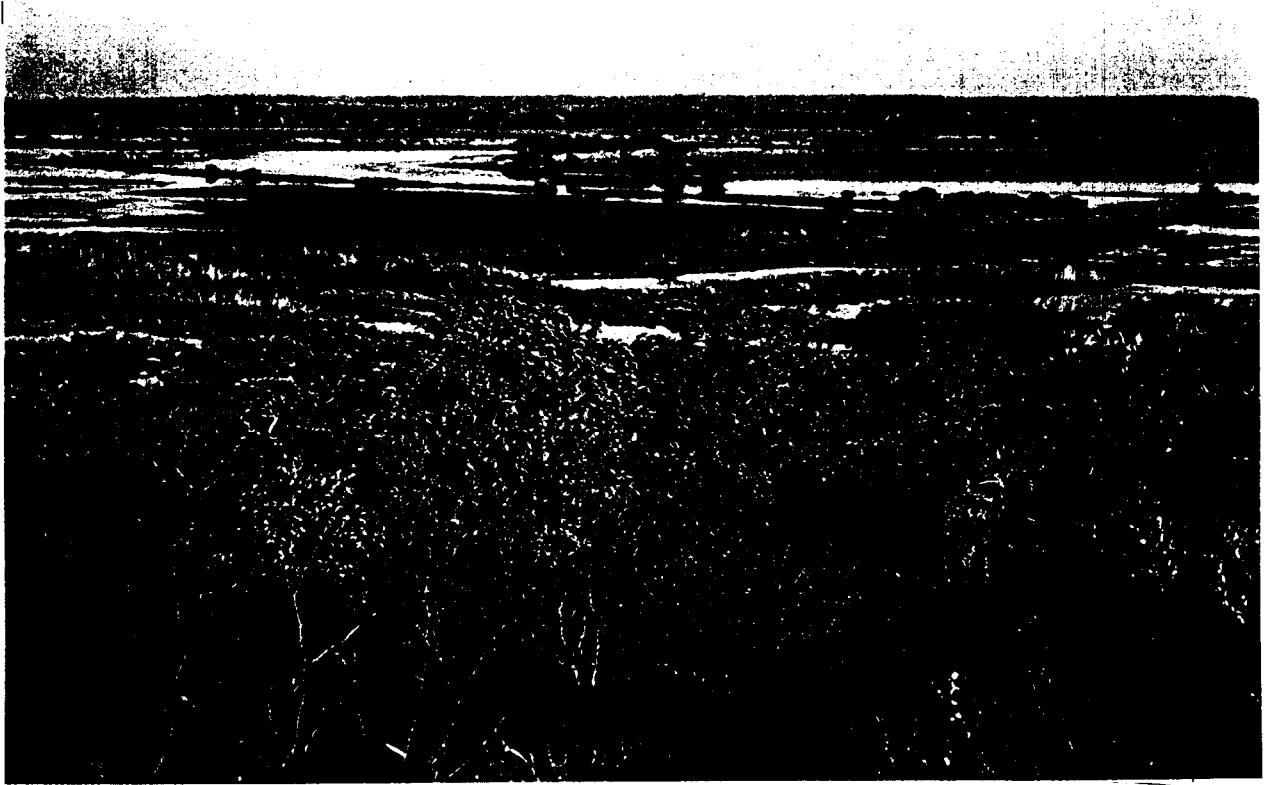
Sedges and water lilies fringe the freshwater pans on the Eastern Shores. In the background lies the large Mfabeni Swamp Forest (Photo by R. de la Harpe).



Swamp Forest is a rare community in South Africa and 64% of pristine Swamp Forest occurs in the Park where it provides habitat for many rare bird species (*Photo by R. H Taylor*).



A mosaic of inter connected wetlands that support a wide diversity of vegetation assemblages is present in the eastern areas of the Park (*Photo by R. de la Harpe*).



A view of the Msunduzi-Mkuzi floodplain showing a diversity of woodland and wetland communities
(Photo by R.H. Taylor).



Several large pans surrounded by dense reedbeds and supporting populations of hippopotamus, crocodiles and many species of birds are found on the extensive Mkuzi floodplain
(Photo by C. Fox).

Sand forest

Sand forest is formally conserved in South Africa only in Ndumo Game Reserve and the Park. This is a semi-deciduous climax dry forest community which provides habitat to many forest bird, mammal and other faunal species. It is found on relict coastal dunes, on highly-leached (nutrient poor) sands. Characteristic species are *Newtonia hildebrandtii*, *Cleistanthus schlechteri*, *Hymenocardia ulmoides*, *Balanites maughamii*, *Dialium schlechteri*, *Combretum zeyheri*, *Croton steenkampianus*, and *C. pseudopulchellus*.

Lebombo forest

This community ranges from closed forest, up to 30 m in height in the moister sites, to lower (15 m), more open forest on drier sites. It provides habitat for many forest bird, mammal and other faunal species, being conserved only in the Park on residual rhyolitic lithosols. Characteristic species are *Chrysophyllum viridifolium*, *Homalium dentatum*, *Combretum kraussii*, *Ficus* spp., *Celtis* spp. and *Strychnos* spp.

Coastal lowland forest

This is the largest remnant of this forest type in South Africa which is not well protected in other protected areas. It is a mixed, subtropical climax community, and the best developed stands may reach 30 m in height. Drainage lines are occupied by swamp forest. This community provides habitat for many forest bird, mammal and other forest faunal species and grows on highly leached (nutrient-poor), recent wind-deposited sands. Characteristic species are *Strychnos decussata*, *S. gerrardii*, *Hymenocardia ulmoides*, *Canthium inerme*, *Scolopia zeyheri*, *Ekebergia capensis*, and the lianes *Monanthes caffra*, *Dalbergia armata*, *Landolphia kirkii*, and *Uvaria caffra*.

Marine vegetation

A total of 325 seaweeds have been recorded in the Park (Schedule 2). This is nearly 78% of the total of 396 seaweeds recorded for the KwaZulu/Natal coastline.

A new species, *Cellophycus condominiumis*, has recently been collected in the northern part of the Maputaland Marine Reserve and a parasitic red algae *Calacopsis smithenae*, a possible new endemic species, has recently been collected off Jesser Point near Sodwana Bay.

Of particular interest are coralline species that dominate open patches and small depressions on shallow reefs. A recent unexpected discovery has been beds of kelp (*Ecklonia biruncinata*), present at depth in the off-shore canyons.

(iii) **Fauna**

Terrestrial invertebrates

Although poorly known, the terrestrial invertebrates occurring within the Park are believed to have universal scientific value. The value lies in the substantial diversity and biomass of this fauna rather than the degree of endemism.

The high diversity amongst insect and mollusc groups found in the Park is evidenced by the following:

Butterflies (<i>Lepidoptera</i>)	-	196 species (being 49% of the species so far found in KwaZulu/Natal) (Schedule 3).
Dragonflies	-	52 species (being 23% of the species recorded for South Africa).
Dungbeetles (Scarabidae)	-	139 species (Schedule 4).

Hole-nesting wasps	-	27 species (Schedule 5).
Biting flies (<i>Tabanidae</i>)	-	64 species (being 38% of the species so far recorded for South Africa)
Chafer beetles (<i>Cetoniidae</i>)	-	58 species (being 33% of the species known for the sub-continent)
Land snails (<i>Mollusca</i>)	-	41 species (Schedule 6).

This diversity provides a wealth of resources and biological processes low in the foodchain, that at one or other stage supports much of the conspicuous fauna. The Park is important because it conserves the southern part of a rich fauna in an area where conditions have favoured its expression on a remarkable scale.

Endemism appears to be low, although this is difficult to estimate because of taxonomic difficulties and the sparseness of collections from areas to the north of the Park. Taxa presently known from type-localities on the coastal plain in or adjacent to the Park may also occur further north. Events that have prompted the evolution of endemic species in other areas, such as the isolation of populations through climatic or geomorphological changes appear not to have played a role with respect to the invertebrate fauna of the Park. Endemism appears to be more marked away from the coast, in forest and riparian woodland habitats.

Despite the present incomplete information, some endemic species are known for the sub-region and include 20 species of Tabanid flies (Usher 1972), one species of Cetonid beetle (Holm and Marais, 1992), five species of butterflies, and ten coastal forest molluscs (Schedule 15).

The forested coastal dunes contain an invertebrate fauna poor in diversity and endemism, probably as a result of the recent geological age of the dunes and their relative instability during changes in sea level during the Cenozoic Era. Earthworms and cryptofauna are scarce possibly as a consequence of the sandy substrate and poorly-developed humus layer.

Aquatic invertebrates

Marine and estuarine invertebrates are by far the most important group of aquatic invertebrates present in the Park. Their importance relates to species richness, their unique community structure and location. It is the coral-inhabited reefs of the Park that are of particular significance in terms of their conservation and scientific value.

These coral reefs, located in the south-western margin of the Indo-Pacific Faunal Province, are some of the southern-most reefs in the world (at 27° 50'S). They owe their existence to the clear, warm subtropical waters of the Agulhas Current, and the absence of silt-carrying rivers in this portion of the KwaZulu/Natal coastline. The reefs range in depth from 8m to just over 35m,

with very few reefs approaching the surface. Coral-inhabited reefs have a limited distribution in South Africa, being almost entirely restricted to Kwa Zulu/Natal and the marine reserves of the Park. Within this area they occur sporadically along the coastline between Cape Vidal and the Mozambique border. The reefs run parallel to the coastline and are confined to the narrow coastal shelf (Figure 4). They are an adapted form of true tropical coral reefs, which typically accumulate from biogenic accretion of primary reef building organisms such as *Acropora spp.* They are considered to be typical of a marginal belt being a veneer of these life forms growing directly on their late Pleistocene sandstone substrate.

The dominant life form of the reefs are corals. A total of 43 scleractinian (hard coral) genera, one member of the fire coral genus (*Millepora*) and ten alcyonacean (soft coral) genera have been recorded to date. A total of 129 species of coral, principally those of Indo-Pacific region affiliation have been identified, including several new and endemic species.

Sponges and tunicates are also a prominent feature of the sessile fauna of the reefs. A total of 14 sponges and four tunicates have been identified.

The marine molluscan fauna is characterised by high species diversity, and forms the southernmost limits in South Africa of the true Indo-Pacific molluscan fauna. A total of 812 species (excludes micro-molluscs under 5mm in size) of marine and estuarine molluscs have been recorded for the Park. This represents 72% of the species so far recorded for the KwaZulu/Natal coast. Species of commercial importance such as cowries (*Cyprædiae*), of which there are 35 species, and the giant clams *Tridaca maxima* and *T. squamosa* which are of international conservation concern, are present in the Park. Extensive beds, up to 1 km² in extent, of *Pinna bicolor* occur on the southern margins of the marine canyons and are believed to be the only such beds reported for the western Indian Ocean region. Their occurrence appears to be determined by the presence of minor upwellings along the axes of the canyon, caused by reversals in the flow direction of the Agulhas Current. The Park contains some rare species, such as the pulmonate limpet *Siphonaria dayi* which has been recorded at only two localities, Inhaca Island off Mozambique, and in the Park at Sodwana Bay. Three species are listed in the International Red Data Book (Schedule 14).

Although also poorly known, the Crustacea are well represented. Some 115 species of benthic amphipods (39% of known South African species) 76 species of isopods (26% of known South African species) and 7 species of Penaeidae (including 5 species of commercial importance) occur within the Park.

Fish

The zoogeographical affinity of the marine fish fauna of the Park is generally Indo-Pacific, and typically west Indian Ocean in character, with nearly 85% of reef fish species endemic to the west Indian Ocean region. However, a number of fish species of Atlantic Ocean origin are also present.

Species diversity is high with 991 species having been recorded (Schedule 8). The species-rich ichthyofauna of the Park is primarily due to the presence, in close proximity, of marine, estuarine and fresh water environments. The fish fauna associated with the coral reefs is particularly species-rich with 399 species, including 25 elasmobranchs, having been recorded. Billfish (Isthiophoridae) are common, and an important feature, with six species having been recorded for the Park.

This species diversity of the marine ichthyofauna is due to the following primary factors:

- * The close proximity of the southward flowing warm Agulhas Current;
- * The presence of a wide range of coastal habitats, which include sandy and rocky shores, coral reefs, deep rocky reefs, and oceanic areas including the ocean canyons; and
- * The close proximity to the St Lucia estuarine system, which is the most important nursery on this coastline for fish and other marine organisms such as crabs, and prawns.

The St Lucia and Maputaland marine reserve components of the Park provide the principal sanctuary for southern Indian Ocean marine fauna on the southeast African coast. Breeding populations of several commercially important endemic fish species, e.g. the Slinger *Charysoblephus puniceus* are present. Features of particular note are firstly, the summer season aggregations (up to 70 individuals being observed) of the Whale Shark *Rhyncodon typus* and the aggregations at certain specific locations in the Park of Raggedtooth shark. These are principally gravid female animals in the early stages of pregnancy.

The fresh water fish fauna of the Park comprises 55 species (Schedule 7) with 22 species found in the Mgobezeleni system, 14 species in the Mkuze system, 11 species in Lake Bhangazi North and 13 species in Lake Bhangazi South (Bruton and Kok, 1980). There are six South African endemics including five KwaZulu/Natal endemic freshwater fish species in the Park. A total of 22 freshwater species reach their southern limit of distribution in the Park. Six species are listed in the International Red Data Book. Sixteen species are listed in the SA Red Data Books (Schedule 14).

For the three estuarine systems in the Park, 212 species have been recorded (Schedule 9). The shallows of Lake St Lucia, the Kosi system, and the off-shore marine reefs sustain large concentrations of larval and juvenile forms of marine life, including fish, prawns, crabs and other aquatic organisms. The lakes, by virtue of their large size, and the provision of shelter and feeding grounds, are the most important nursery area for these aquatic organisms on the east coast of South Africa (Wallace and van der Elst, 1975; Blaber 1980).

One of the largest fish species in both freshwater and estuarine systems in the Park is the Zambezi Shark *Carcharhinus leucas*, which attains a weight of up to 214kg. Although primarily a pelagic sea fish, it has the ability to tolerate

fresh water for prolonged periods.

Amphibians and reptiles

High levels of species richness are displayed by the herpetofauna, with 159 species present in the Park. There are 50 species of amphibia and 109 species of reptiles (Schedules 10 and 11). Within the Reptilia there are 12 species of *Chelonidae* (5 marine, 4 freshwater and 3 terrestrial species), 53 species of snakes, 42 species of lizard and chameleon, and 1 species of crocodile.

The Park represents either the southernmost or northernmost limit of natural distribution for a large number of herpetofaunal species. It is the southernmost recorded limit of natural distribution for fifteen reptile and nine amphibian species. The only recorded locality in South Africa for Bouton's coral rag skink *Cryptoblepharus boutonii africanus* lies within the Park and this location is the most southerly point of this cosmopolitan species distribution. For three species of *Chelonidae* (leatherback turtle, loggerhead turtle and yellow-bellied hinge terrapin), the Park provides sanctuary for the southernmost recorded breeding populations. For two amphibian species, Natal leaf-folding frog *Arixalus spinifrons spinifrons* and Pickersgill's reed frog *Hyperolius pickersgilli*, the Park is the northernmost limit of their distribution.

The Maputaland coast is a breeding locality for two species of sea turtle, the loggerhead *Caretta caretta* and the leatherback *Dermochelys coriacea*. The Park also provides the principal breeding grounds for these two species in southern Africa. The Green turtle *Chelonia mydas* is a non-breeding resident, whereas the hawksbill *Eretmochelys imbricata* and Olive Ridley *Lepidochelys olivacea* turtles are regular visitors to the Park.

The distribution of the Mozambique shovel-snout snake *Prosymna janii*, and three South African endemic species, namely the striped burrowing skink *Scelotes vestigifer*, Fitzsimon's burrowing skink *S. fitzsimonsi*, and Setaro's dwarf chameleon *Bradypodion setaroi* is confined to the coastal dune system (van Teylingen *et al.* 1993). The Park contains populations of five amphibian species which are endemic to KwaZulu/Natal (Schedule 15).

Lake St Lucia and its associated fresh water systems provide habitat for one of the largest populations of Nile crocodile *Crocodylus niloticus* on the sub-continent. It is estimated that approximately 1 500 individuals over 2m long are present. This species is an important predator within aquatic systems in the Park.

A total of six reptiles are listed in the International Red Data Books, and a total of 20 reptiles and two amphibians occurring in the Park are listed in the South African Red Data Books (Branch, 1988). There are 16 reptile species which are listed in CITES appendices (Schedule 14).

Birds

High species richness is reflected in the avifauna of the Park with a checklist of 521 species representing 60% of the South African avifauna (Schedule 12). This is a consequence of the wide variety of terrestrial, wetland and aquatic habitats in the area and its geographical position either as a destination or a stop-over for migratory species. There are 47 subspecies of birds that are endemic or near-endemic species to the region in which the Park is situated, and the Park contains populations of four South African endemics (Schedule 15). It is one of the principal avifaunal breeding areas in South Africa as 339 bird species (62% of the total list) are known to or are considered to breed here. The Park is of particular importance as a breeding area for the Pinkbacked pelican *Pelecanus rufescens*, White pelican *Pelecanus onocrotalus*, Caspian tern *Hydroprogne caspia*, Pygmy goose *Nettapus auritus*, Rufous-bellied heron *Butorides rufiventris*, Redwinged pratincole *Glareola pratincola*, and Greyrumped swallow *Pseudhirundo griseopyga*. The Park provides habitat for the principal populations in South Africa of Osprey *Pandion haliaetus*, Neergaard's sunbird *Nectarinia bifasciata*, Woodward's batis *Batis fratrum*, Natal nightjar *Caprimulgus natalensis*, Blackrumped button-quail *Turnix hottentotta*, Black coucal *Centropus bengalensis* and Short tailed pipit *Anthus brachyurus*.

A total of 97 migrant bird species (19% of the total list) have been recorded, of which 23 species breed within the Park. Lake St Lucia and its associated wetlands form one of the most important refuges on the Southern African subcontinent for large numbers of many species of migratory waterfowl and wetland birds. Of approximately 200 water bird species recorded for the Park, the migratory species are waders (31 species), ducks and geese (15 species), flamingos (2 species) and herons and egrets (15 species). A notable feature occurs during hypersaline states of Lake St Lucia when concentrations of flamingos reach up to 50000 birds.

A total of 62 birds occurring in the Park have been listed in the South African Red Data Book, and there are 73 species which are listed in CITES appendices (Schedule 14).

Mammals

There are 129 species of terrestrial and marine mammals occurring in the Park. Viable breeding populations of 97 terrestrial mammal species are present (Schedule 13). The terrestrial mammal fauna of the Park is particularly species-rich in the southern African context as it has 22% of the Insectivora, 32% of the Chiroptera, 51% of the Carnivora, 53% of the Artiodactyla and 21% of the Rodentia known for the sub-continent.

The Park supports the largest single populations of the following species in South Africa; Hippopotamus *Hippopotamus amphibius*, Red duiker *Cephalophus natalensis natalensis*, Nyala *Tragelaphus angasii* and Southern reedbuck *Redunca arundinum*. In addition, the Park supports the largest formally protected populations in KwaZulu/Natal of the following species: Thick-tailed bushbaby *Otolemur crassicaudatus*, Samango monkey *Cercopithecus mitis*, Side-striped jackal *Canis autoists*, Banded mongoose

Mungos mungo, Brown hyaena *Hyaena brunnea*, Steenbok *Raphicerus campestris*, Impala *Aepyceros melampus*, Bushbuck *Tragelaphus scriptus*, Tonga red squirrel *Paraxerus palliatus tongensis*, Cane rat *Thryonomys swinderianus* and Four-toed elephant shrew *Petrodromus tetradactylus*.

The Park is also the only protected area in KwaZulu/Natal known to have populations of the following species: Lesser red musk shrew *Crocidura hirta*, Greater dwarf shrew *Suncus lixus*, Egyptian fruit bat *Rousettus aegyptiacus*, Geoffroy's horseshoe bat *Rhinolophus clivosus*, Short-eared trident bat *Cloeotis percivali*, Butterfly bat *Chalinolobus variegatus*, Schlieffen's bat *Nycticeius schlieffenii*, Lesser woolly bat *Kerivoula lanosa*, Ansorge's free-tailed bat *Tadarida ansorgei*, Angola free-tailed bat *Tadarida condylura*, Side-striped jackal *Canis autoists*, Bushveld gerbil *Tatera leucogaster*, and Highveld gerbil *Tatera brantsii*.

Other terrestrial species of particular note include:

- * Black rhinoceros *Diceros bicornis*, which has an increasing population from the present number of 95 individuals;
- * White rhinoceros *Ceratotherium simum*, which has an increasing population from present estimate of 150 individuals;
- * Five South African endemic species or sub-species are present, namely: the Hottentot Golden Mole *Amblysomus hottentotus*, the Hairy slit-faced bat *Nycteris hispida*, the Natal Red Hare *Pronolagus crassicaudatus*, the Tonga red squirrel *Paraxerus palliatus tongensis*, and the Red duiker *Cephalophus natalensis natalensis*, the latter having a population of approximately 1000 in the Park (Schedule 15);
- * Nine species or sub-species reach their southernmost limits of distribution in the Park. They include four bats: Short-eared trident bat *Cloeotis percivali*, Butterfly bat *Chalinolobus variegatus*, Schlieffen's bat *Nycticeius schlieffenii*, Ansorge's free-tailed bat *Tadarida ansorgei*, Side-striped jackal *Canus autoists*, Suni antelope *Neotragus moschatus*, Tonga red squirrel *Paraxerus palliatus tongensis*, Bushveld gerbil *Tatera leucogaster*, and Four-toed elephant shrew *Petrodromus tetradactylus*.

The population size of the following species have been estimated as:

White rhinoceros	150	Oribi	30
Black rhinoceros	95	Steenbok	300*
Burchell's zebra	1 200**	Suni	300**
Warthog	4 000*	Impala	9 000*
Bushpig	500*	Buffalo	170
Hippopotamus	800*	Kudu	600

Giraffe	180	Nyala	8 000*
Blue wildebeest	1 700**	Bushbuck	700*
Red duiker	1 000*	Southern reedbuck	6 000*
Grey duiker	1 000	Waterbuck	280

* = largest population in KwaZulu/Natal

** = second largest population in KwaZulu/Natal

Populations of bottlenose dolphin *Tursiops truncatus*, humpback dolphin *Sousa plumbea* and spinner dolphin *Stenella longirostris* are resident within the Park. During winter, migrations of both humpback whale *Megaptera novaengliae* and southern right whale *Eubalaena australis* take place which may be observed from the shore. A total of 32 marine mammals occur in the Park (Schedule 13).

Of the terrestrial mammal species, one species, the Black Rhinoceros *Diceros bicornis*, is listed as endangered in the International Red Data Book, 22 species are listed in the South African Red Data Books, and 18 species appear in CITES appendices. All 32 marine mammals which occur in the Park are listed in both the International Red Data Book and the CITES appendices (Schedule 14).

(iv) Habitats for threatened species of outstanding universal value

It is considered that there are four habitats in the Park that are of global conservation importance. These are:

The nesting beaches for the Leatherback turtle (*Dermochelys coriacea*) and Loggerhead turtle (*Caretta caretta*)

The populations of the two species of turtles nesting in the Park are the largest on the entire eastern coast of Africa. Based on the past five years of monitoring, the number of adult female loggerhead turtles is estimated at 2500 animals, and the number of female leatherback turtles is estimated at 750 animals. These numbers represent a significant increase in turtle population size since the inception of the Natal Parks Board's turtle conservation management programme in the early 1960's, and are directly attributable to this programme. Elsewhere, populations of both species are declining, stressing the significance of the Park for the continued viability of these species.

The woodlands and thicket areas for the Black rhinoceros (*Diceros bicornis minor*)

Until recently the population of Black rhinoceros in the Park was confined to the Mkuzi Game Reserve component area, where the original surviving

population has increased from approximately 45 animals to the current 95 animals, with successive translocation involving more than 50 animals having taken place to establish new populations elsewhere. Between 1984 and 1988, 17 animals were re-established in the Eastern Shores area and the population has subsequently increased in size. Large areas of woodland and thicket habitat are available to this expanding population. Together with the Hluhluwe-Umfolozi Park and the Kruger National Park, the Park has the potential to be one of the three most important and secure conservation areas for the conservation of a viable population of this threatened species in South Africa. It is a vital component of the Natal black rhino metapopulation, managed according to the National Plan for the Conservation of Black Rhinoceros (Brooks, 1990). The potential productive carrying capacity of the Park for Black rhinoceros is estimated at approximately 240 animals. The plight of Black rhinoceros in the rest of Africa has been a matter of international conservation concern as population numbers have decreased dramatically, and in many states have become extinct, or are approaching extinction. For example, the number of animals in Africa in 1970, was estimated at 65000, whereas present estimates are less than 4000 animals. The Park populations represent a significant component of the current, and expanding, black rhino populations in South Africa, and a growing proportion of the extant world population of this species.

The dry sand forest/bushland areas having an exceptionally high species richness

The dry sand forest bushland habitat is a unique assemblage of plant and animal species that requires further detailed study. The full range of this habitat type occurs in the Park, from the oldest forms on relatively more eutrophic sands in the west, to the younger forms on more dystrophic sands near the coast in the east. The habitat is restricted to the southern portion of the Mozambique coastal plain south of Maputo. Where it occurs outside of a protected area, it is under threat by settlements of people. The dry sand forest habitat has a high plant and animal species richness. Important species include animals such as Suni antelope *Neotragus moschatus*, Tonga red squirrel *Paraxerus palliatus tongensis* and Four-toed elephant shrew *Petrodromus tetradactylus*; birds such as African broadbill *Smithornis capensis*, Squaretailed drongo *Dicrurus ludwigii*, Yellowspotted nicator *Nicator gularis*, Stierling's barred warbler *Camaroptera stierlingi*, Neergaard's sunbird *Nectarinia neergaardi*, and Pinkthroated twinspot *Hypargos margaritatus*; and plants such as *Rhipsalis baccifera*.

The habitat is particularly rich in butterfly species with a total of 111 species recorded (Schedule 3), of which 6 species are listed as threatened in the South African Red Data Book (Schedule 14). Three species and two subspecies are endemic (Schedule 15).

The diversity of wetland habitat types

Within an equivalent area there is no other place in southern Africa, and possibly even in Africa, that encompasses the huge diversity of wetland

habitat types as found in the Park. Although detailed more fully in Section 2.2.2, the major types are:

- * Swamps - freshwater reed and papyrus swamps
 - saline reed swamps
 - sedge (*Eleocharis*) swamp
- * Salt-marshes
- * Macrophyte beds (submerged)
- * Grasslands - *Echinochloa* floodplain grassland
 - Low-lying grasslands on clay substrates
 - Hygrophilous grasslands on sandy substrates
- * Riverine woodlands
- * Mangroves
- * Swamp forests

The range of wetland types extends from dystrophic edaphic environments to eutrophic environments on sands. This variety of wetland types is remarkable, both in terms of its variable alpha diversity, as well as the high species' turnover between types (beta diversity), as it has resulted in highly variable community structure and composition, in close juxtaposition. This is even more remarkable if one considers that the complex of interlinked wetlands extends across the complete salinity gradient from freshwater to marine environments.

(v) Species of global conservation importance

Species of global conservation concern have been listed as threatened species in the international Red Data Books. A number of such species from several groups occur and or breed in the Park (Schedule 14). These include: 3 molluscs, 6 freshwater fish, 6 reptiles, 1 mammal and 4 marine mammal species (with a further 28 species where their status is regarded as being "insufficiently known").

3.2 History and Development

3.2.1 History of the region

The first evidence of human occupation of the Park dates from the Early Stone Age. Three occupation sites of the Acheulian culture (between 500 000 and a million years B.P.) have been found in the Park (Avery, 1980). There is evidence that people of Middle and Late Stone Age cultures inhabited the Maputaland area since the Last Interglacial and probably for as long as 110 000 yrs (Beaumont *et al.*, 1978).

The Maputaland Plain which includes the area of the Park, was widely settled by pre-

colonial agriculturists in the Early (250-1 000 AD) and Late Iron Age (1000-1 840 AD) periods (Maggs, 1984). Shell middens on the coast testify to extensive use of colonies of black mussels (*Perna perna*) as a food source (Hall and Vogel, 1980; Maggs *et al.*, 1992). It is believed that these early agriculturists occupied sites along the coastline as early as 1 600 years ago and cut their fields and lived in the coastal forest. They used fire, burning grassland areas to provide grazing for their livestock at certain times of the year. These activities created areas of secondary grassland within the Park. Little is known about the nature of these human settlements, or the relationships between these people and those who subsequently occupied the area.

During the early part of the nineteenth century, the Maputaland area was occupied by both Nguni-speaking people in the south and Tembe-Thonga people in the north. There appears to have been clear linguistic and cultural distinction between these two groups (Maggs, 1989). The evidence suggests that these people migrated southward down the coastal plain from the Delagoa Bay area to the north (Bryant, 1929; Dominy, 1992).

Rivalry between the southern emerging chiefdoms, the Ndwandwe and Mthethwa and the expansion of militarism in the subordinate Sokhulu chiefdom in the east and Zulu chiefdom in the west, led in 1819 to the rapid expansion of Zulu overlordship in the region, under the leadership of Shaka (Wright and Hamilton, 1989).

Although dominated by the Zulus, the Tembe-Thonga were never completely assimilated into the traditional social and political structures of the Zulus (Mountain, 1990).

Due to the prevalence of malaria and the cattle disease trypanosomiasis, carried by the tsetse fly *Glossina*, extensive areas of what is now the Park were uninhabited (Bruton *et al.*, 1980). When the French naturalist and hunter Delegorgue visited the Lake St Lucia area between 1838 and 1844, he encountered the Sokhulu people under the chief Nqoboka Kalanga near St Lucia estuary (Delegorgue, 1990). Small scattered settlements were present between Sodwana and St Lucia estuary, evidenced by several traditional burial sites. These people were specialists in iron smelting and collected bog iron from the wetlands. Trees were felled to produce charcoal for their smelters (Hall and Vogel, 1980). The effects of their agricultural and iron-smelting activities on the environment is considered to have significantly modified habitats, by increasing the area of sub-climax grassland at the expense of forest and thereby creating favourable habitat for grazing species (Taylor, 1980).

Important events in the history of the Zulu nation took place within, or in the immediate vicinity of the Park, in the late 19th century. The first concerns the earliest recorded instance of purposeful wildlife conservation in the sub-region. A traditional wildlife sanctuary was established in the mid 19th century by Inkosi (Chief) Shangase Manukuza and Induna (Headman) Hebeni Manzi within the present day boundaries of the Mkuze Game Reserve component of the Park.

The Battle of eTshaneni took place on 5 June 1884, within the precipitous gorge of the Mkuze River, close to or within the north-western extremity of the Park. During the Anglo-Zulu war of 1879, King Cetshwayo had been assisted at the Battles of Isandhlwana and Ulundi against the British Army by Zibhebhu of the Mandhlakazi

Clan. However, Zibhebhu subsequently turned against Cetshwayo and defeated him in battle in 1883. Dinizulu, Cetshwayo's successor, took revenge on Zibhebhu and defeated him at eTshaneni. He was assisted by a group of Boers, which included Louis Botha who subsequently became the first Prime Minister of the Union of South Africa in 1910. The deaths of large numbers of Zulus on the slopes of eTshaneni resulted in the hill been called Ghost Mountain ever since (Mountain, 1990).

Arab traders had reached as far south as the Mkuze River in the 13th and 14th centuries, evidenced by the discovery of venetian trade beads in Mkuzi Game Reserve (Mountain, 1990). Early accounts of St Lucia and Maputaland were provided by Portuguese navigators, and shipwreck survivors, forced to travel overland to Delagoa Bay. The name St Lucia was first applied to the Thukela River to the south in 1514, and inadvertently transferred to the present lake and estuary in 1575 (Mountain, 1990). The first detailed account was by Delegorgue (1990) who paid two visits to the area. Other accounts were given by Baldwin who hunted in the area in 1851 and 1853 (Baldwin, 1894). Struthers, also a hunter, negotiated for hunting rights in the Eastern Shores area of the Park (Dominy, 1992).

During this period, the wildlife resources of the Maputaland area had become of major economic significance to the Natal colonial government. Natural products such as ivory and hides were principal export commodities, and exploitation focused mainly on hunting the abundant game present in the area. Firearms became more readily available to the indigenous peoples, and hunting escalated. Shortly before the turn of the century, the British Governor of Zululand commented that, "we may be within measurable distance of the total destruction of game in Zululand" (Ellis, 1975).

Concern about the destruction of wildlife in Zululand, after the annexation of the territory by Britain in 1887, led to the demarcation of five areas as game sanctuaries in 1895, including St Lucia. Finally, the Zululand Government's Proclamation No. 2 of 1897 provided for the first official game reserves in Zululand (Minnaar, 1989). Since then, additional areas have been identified and proclaimed as game and nature reserves. Today these adjoining areas collectively constitute the Greater St Lucia Wetland Park.

Conflicts between the developing cattle-ranching industry and the game populations which carried trypanosomiasis, led to the wholesale destruction of game outside of sanctuaries from 1910. Extensive game eradication campaigns were launched from 1920 until the late 1940's, when aerial spraying of insecticides superseded hunting as a form of control. The use of DDT and BHC resulted in the complete eradication of tsetse fly and trypanosomiasis in Zululand (Minnaar, 1989).

In 1956, the then State Department of Forestry commenced commercial afforestation in the subregion, including the Eastern Shores State Forest by establishing plantations, mainly of *Pinus elliotti*. People living near Mission Rocks and Lake Bhangazi South were moved and relocated in tribal areas to the west of the Park. Over the years the area of plantation on the Eastern Shores grew to exceed 5 000 ha (Stubblings & Venter, 1992). In 1991 the Department began to phase out the commercial forestry operation because of its poor economic viability in this area and because the Eastern Shores was designated to be incorporated into the Greater St

Lucia Wetland Park.

During the second world war, a Royal Air Force Catalina flying boat squadron operated for nearly two years on the lake. Later, during the 1970's and 1980's, the South African Defence Force established and operated a small missile testing facility on the western shore of Lake St Lucia. Although live heads were not used for missiles, it did require that people living in certain parts of the Sodwana State Forest area were moved and relocated in neighbouring areas. Missile testing ceased in November 1990.

In 1974 and 1976, sand-mining prospecting leases in the Eastern Shores State Forest were granted to a mining company. Following on the results of their exploration of ilmenite deposits the company applied in 1989 to the Department of Mineral and Energy Affairs for authorisation to mine. Considerable public opposition to mining at St Lucia resulted, and the government announced that an environmental impact assessment (EIA) would be undertaken by the Council for Scientific and Industrial Research (CSIR, 1993a, 1993b and 1993c). The EIA was reviewed and public hearings were held by an appointed independent Review Panel. The panel concluded that no mining should be allowed in the Greater St Lucia area (Leon *et al*, 1993). In the Panel's judgement, mining the Eastern Shores would cause unacceptable damage to a place which is special because of its rich history, ecological and biological diversity and the significance it has in the eyes of its many visitors. Referring to this unique combination, the Panel stated that there was no substitute for St Lucia and recommended that the necessary steps be taken for it to acquire World Heritage Status. Mindful of the plight of the original inhabitants, the Panel recommended that the area be managed in such a way that direct benefits would accrue to both local communities and the nation. In pursuance of these recommendations, the former Natal Parks Board has established the "Greater St Lucia Wetland Park Liaison Committee" representing the major interested and affected parties in the region. The KwaZulu-Natal Nature Conservation Service has subsequently prepared this World Heritage nomination proposal.

3.2.2 History of preservation / conservation

Extensive destruction of the once abundant wildlife of the Natal/ Zululand region occurred during the early to mid nineteenth century. By the 1880's, hunting had severely depleted the ungulate fauna of Zululand, with commercially valuable species, such as elephant, hippopotamus and buffalo, being particularly badly affected. Traditional systems of faunal resource management had collapsed (Dominy, 1992). Awareness of the need to protect wildlife became apparent and was recognized when the British administration in Zululand promulgated legislation to regulate hunting in the region during the 1890's. In 1906, the game laws for Natal and Zululand were consolidated, and in 1912, the laws regarding coastal fishing were extended to include the Zululand coast. The first five reserves to be set aside by the Zululand Government in 1895 included the "St Lucia Reserve No. 1" in 1895. In 1897, in terms of a new law which provided for the establishment of game reserves, the status of four (including the St Lucia Reserve) was reaffirmed. These areas are the oldest extant game reserves on the African continent (Ellis, 1975). Subsequent proclamations have added areas which now comprise the Greater St Lucia Wetland Park. These were Mkuzi Game Reserve in 1912, St Lucia Park in

1939, False Bay Park in 1944, Sodwana Bay National Park in 1950, Kosi Bay Nature Reserve in 1950, St Lucia Marine Reserve in 1979, Mapelane Nature Reserve in 1986, Coastal Forest Reserve in 1992 and Lake Sibayi Freshwater Reserve in 1994. In addition, a number of areas, established in 1956 as state forest nature reserves, were incorporated in the Park. These are the Cape Vidal and Sodwana areas in 1988, and the Eastern Shores and parts of the Nyalazi and Dukuduku areas in 1993. Other additions to the Park have been made with the assistance of the Southern African Nature Foundation (the local agency of the IUCN), to ensure its consolidation as a single unit.

Prior to the formation of the Union of South Africa in 1910, the responsibility for implementing the game laws lay with the game conservator for Zululand who was assisted by the Natal Police. The first game conservator was appointed in June 1895. The 1910 Union Act provided for the control of game and fish to be delegated to the provinces. In accordance with the provisions of this Act, the Natal Provincial Administration appointed Mr F. Vaughan-Kirby as Game Conservator for Zululand in 1911. In 1928 Mr R. Symons took over and he was succeeded by Capt. H. Potter in 1929. He was stationed in the Hluhluwe Game Reserve and held this post until his retirement in 1950. Nature conservation in the region had the support of several influential members of the Natal Provincial Administration, namely Mr A.E. Charter (appointed Provincial Secretary in 1928), Mr W.M. Power and Mr D.E. Mitchell (members of the Provincial Council).

In 1935, the "Game Reserves Commission" was appointed. One of their recommendations was for the establishment of the Zululand Game Reserves and Parks Committee. The committee resulted in the Zululand Game Reserves and Parks Board being constituted in terms of a provincial ordinance in 1939. It was this ordinance which formed the basis of the 1947 ordinance (No. 35 of 1947) which constituted the Natal Parks Board. The Board assumed control of the game reserves, and since then has been responsible for implementing conservation management programmes in Natal.

Since 1968, the Natal Parks Board was assisted in the scientific management of Lake St Lucia by the St Lucia Scientific Advisory Council (SCADCO) which has supported and supervised biological research, and recommended specific courses of action in the light of monitoring and research results. Management objectives conform to those specified by the Commission on National Parks and Protected Areas of the IUCN (The World Conservation Union), for national parks and equivalent areas (Category II).

The provision of accommodation facilities, such as hatted camps and camp-sites, has been undertaken over several decades according to user demand at Cape Vidal, Charter's Creek, False Bay, Fanie's Island, Mapelane, Sodwana Bay and at St Lucia Estuary.

Under the Ramsar Convention to which South Africa is a signatory, two sites in the Park were designated as wetlands of international importance in October 1986. These are the St Lucia Site and the Turtle Beaches/Coral Reefs of Tongaland. In June 1991, Lake Sibaya and the Kosi System were designed as wetlands of international

importance. Therefore, included within the nominated property of the Greater St Lucia Wetland Park are four designated wetlands of international importance.

Several conservation programmes have achieved highly successful results and have been widely acknowledged.

* Black rhinoceros and hippopotamus conservation

At about the time of the proclamation of Mkuzi Game Reserve in 1912, only two remnant populations of black rhinoceros survived in South Africa. These were in the Hluhluwe and Mkuzi Game Reserves. Conservation programmes in the Park ensured that populations were adequately protected, and have resulted in an increase in population numbers. Similar conservation measures were applied to the remnant population of hippopotamus at Lake St Lucia.

* Sea turtle conservation

On the Maputaland beaches, hunting of turtles during the breeding period had impacted populations of both species of nesting turtles. An intensive sea-turtle conservation programme was initiated in 1963 which continues to the present day. Measures to protect nesting females and their eggs have been enforced, and an annual population monitoring programme has been implemented for over thirty years.

* Crocodiles

Concern regarding a perceived decline in numbers of Nile crocodiles resulted in a captive breeding programme for this species being established at Ndumo Game Reserve in 1965. This centre was moved to St Lucia in 1974. At the request of the IUCN, the station is undertaking a breeding programme for two other endangered species of crocodile from West Africa, i.e. the dwarf crocodile and long-snouted crocodile. Large numbers of captive-bred Nile crocodiles have been released into the wild, or made available for crocodile breeding programmes elsewhere.

* Re-establishment programmes

Programmes aimed at the re-establishment of locally extinct species have also been successful. In particular, there have been successful introductions of buffalo *Syncerus caffer*, waterbuck *Kobus ellipsiprymnus*, leopard *Panthera pardus*, brown hyaena *Hyaena brunnea*, and elephant *Loxodonta africana*.

* Land acquisition, restoration and development programmes

In 1992, the Mkuzi Game Reserve was linked to the remainder of the Park by the acquisition of key properties. These properties included such key areas as the lower wetlands and floodplain of the Mkuze and Msunduze rivers, providing a critically important geographic and ecological corridor along the Mkuze River. Old croplands occurring on the property are presently being rehabilitated. Future conservation work in the Park will focus on rehabilitation

programmes for the clear-felled plantation areas on the Eastern Shores, the control of alien species, management of ungulate populations and controlled fire management programmes to maintain certain vegetation communities. The ongoing implementation of the ecotourism concept development plan is a necessary programme to ensure that the sustainable benefits of the Park are harnessed and contribute to the local and regional economy, and also to provide opportunities for access to the Park.

3.3 Form and date of most recent records of property

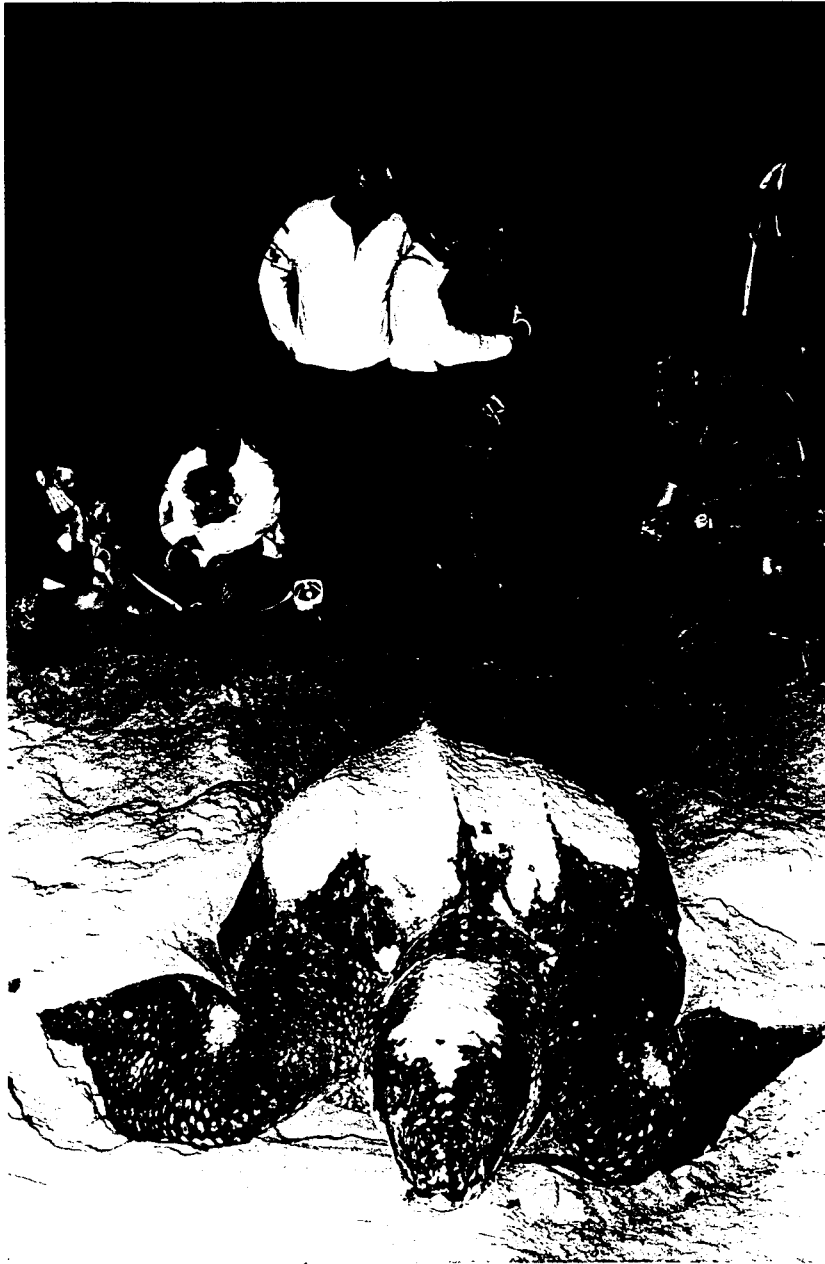
There are extensive records of the Park on the physical environment, the biota, management activities and results, both past and present research projects being undertaken. Monitoring records are either updated annually or more frequently as required by the respective programme. Records are in the form of several computerized databases including a geographical information system. These are located at St Lucia, the Pietermaritzburg head office, Oceanographic Research Institute as well as other institutions such as universities. Many records are in the form of reports and publications contained in offices and libraries under the control of the KwaZulu-Natal Nature Conservation Service.

3.4 Present state of conservation

Almost the entire 289 376 ha area of the Park is in an unmodified, near-pristine condition. Portions of the Park have been formally protected for almost a century, being among the oldest areas set aside for conservation in Africa. The Park, although utilised by man for thousands of years, has never been occupied by significantly large human settlements, nor has the area been subjected to significant man-induced land-use disturbances. Indeed, the presence of stone age and iron age man in the Park is likely to have contributed to the diversity of habitat types in some areas. The largest area transformed in recent history, representing approximately 2 % of the total area (5 000 ha) is an area of plantation in the Eastern Shores component of the Park. In addition, a system of roads used by visitors, and for management purposes, has been established in the Mkuzi Game Reserve and Eastern Shores components. Sensitively planned accommodation is provided within designated development nodes at Kosi Bay Camp, Manzengwenya, Mantuma, Sodwana Bay, Cape Vidal, Fanie's Island, Charter's Creek and Mapelane, according to an Ecotourism Concept Development Plan. Based on the principles of Integrated Environmental Management, the ecotourism plan is designed to provide appropriate and sustainable access to the resources within the Park, while ensuring the protection of the natural resource-base, and the equitable distribution of benefits to local communities and the region. It is estimated that approximately 1% or less of the area of the Park has been transformed by these developments. The natural ecological and geomorphological processes function with little or no significant detrimental interference by the activities of man. Where there have been impacts, the Park management approach is to restore such areas to their former status.

3.5 Policies and programmes : presentation and promotion of the property

There is a progressive neighbour relations policy, to foster good relations with communities who reside in the immediate vicinity of the Park. This policy promotes the values of the protected area to its neighbours. It ensures that they derive direct benefits from the protected area in a variety of ways, including free access and business and employment opportunities. The range of business opportunities includes the marketing of curios and fresh produce to Park visitors, at designated market places.



A Leatherback turtle (*Dermochelys coriacea*) laying eggs after excavating a nest hole being watched by a tour group of visitors (Photo by R. de la Harpe).



The giant clam is of international conservation importance and two species (*Tridacna* spp) occur in the Park (Photo by Dennis King).



Part of the large White pelican (*Pelicanus onocrotalus*) breeding colony at Selley's on Lake St Lucia (Photo by Paul Dutton).



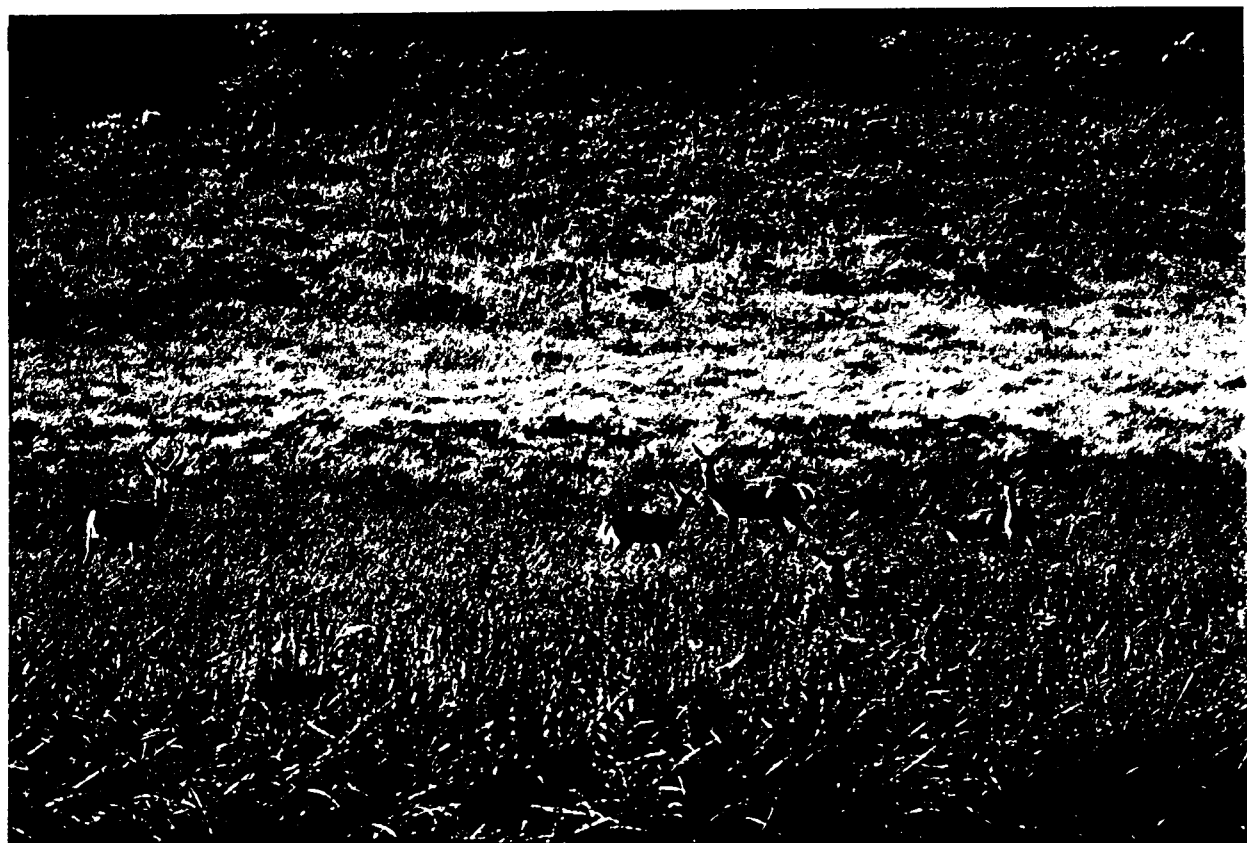
A male Nyala antelope in the dry woodlands of Mkuzi Game Reserve. The Park supports the largest population of this species in South Africa which is estimated at 8 000 animals
(Photo by R. de la Harpe).



A cow and calf Black rhinoceros (*Diceros bicornis*) photographed in Mkuzi Game Reserve. The population of this species has increased in the Park to its present level of 95 animals and is expected to increase further to a potential productive carrying capacity of 240 animals
(Photo by Shaen Adey).



A herd of Impala (*Aepyceros melampus*) and Blue wildebeest (*Connochaetes taurinus*) gather at an ephemeral rain-filled waterhole in Mkuzi Game Reserve (Photo by R de la Harpe).



Sedge and hygrophilous grassland communities occur in the inter-dune troughs on the Maputaland coastal plain and attract numbers of feeding Southern reedbuck (*Redunca arundinum*) (Photo by R. de la Harpe).

4. MANAGEMENT

4.1 Ownership

All the land comprising the Park is state-owned, being registered in the name of the President of the Republic of South Africa. Control and management of the Park has been delegated by the KwaZulu-Natal Provincial Administration to the KwaZulu-Natal Nature Conservation Service. The address is:

KwaZulu-Natal Nature Conservation Service
P.O. Box 662
3200 PIETERMARITZBURG
SOUTH AFRICA

4.2 Legal status

The laws which establish the Park as a conservation unit are the KwaZulu-Natal Nature Conservation Management Act No 9 1997, the Natal Nature Conservation Ordinance No. 15 of 1974, the KwaZulu Nature Conservation Act No.29 of 1992, the Republic of South Africa Forest Act No. 122 of 1984, and the Sea Fishery Act No. 12 of 1988. Every Act passed by the South African Parliament requires the signature of the President. The right of the President to assign responsibility for the Acts to various ministers in charge of particular portfolios, and the Premier of KwaZulu-Natal, has emanated from the Constitution of South Africa, 1996

The legislative enactment governing the former Natal Parks Board, and under which the then Administrator of Natal proclaimed nature reserves in the province, was the Nature Conservation Ordinance No. 15 of 1974. The proclamation of protected areas in KwaZulu-Natal by the Minister is now enabled by the KwaZulu-Natal Nature Conservation Management Act. The responsibility for the establishment of marine reserves, in terms of the Sea Fishery Act No. 12 of 1988, and state forest reserves, in terms of the Forest Act No. 122 of 1984, was assigned to the respective national ministers. These powers have subsequently been devolved to the Provinces, and the control and management of areas proclaimed under the Forest Act and Sea Fishery Act now rests with the KwaZulu-Natal Nature Conservation Service .

The Natal Parks Board was until recently, and for a period of 50 years, responsible for the management of the Park. The Natal Parks Board amalgamated with the former KwaZulu Department of Nature Conservation to form a new organization, the KwaZulu-Natal Nature Conservation Board and Service, that is now responsible for the management of the Park. The former Natal Parks Board was constituted under the Nature Conservation Ordinance (Natal) No. 15 of 1974. The following component areas of the Park were originally proclaimed in terms of this ordinance, and have now been incorporated under the new KwaZulu-Natal Nature Conservation Management Act:

False Bay Park

Mkuzi Game Reserve
 Sodwana Bay National Park
 St Lucia Game Reserve
 St Lucia Park

The following component areas were set aside under the Government of South Africa, Forest Act No. 122 of 1984, as amended:

Cape Vidal State Forest
 Dukuduku State Forest
 Eastern Shores State Forest
 Mapelane Nature Reserve
 Nyalazi State Forest
 Sodwana State Forest

The following component areas were set aside under the Government of the Republic of South Africa, Sea Fishery Act No. 12 of 1988, as amended;

St Lucia Marine Reserve
 Maputaland Marine Reserve

In addition, the following area has been established as a tribal nature reserve, managed jointly by the Makasa Tribal Authority and the KwaZulu-Natal Nature Conservation Service:

Makasa Nature Reserve

The following component areas were set aside under the KwaZulu Nature Conservation Act No.29 of 1992;

Coastal Forest Reserve
 Lake Sibayi Freshwater Reserve

The Park enjoys full legal protection under the provisions of the KwaZulu-Natal-Nature Conservation Management Act No 9 1997, the Natal Nature Conservation Ordinance No. 15 of 1974, the Forest Act No. 122 of 1984, the Sea Fishery Act No. 12 of 1988, the Sea-Shore Act No. 21 of 1935. Provisions within the Water Act No. 54 of 1956 as amended and the Environment Conservation Act No. 73 of 1989 as amended, also ensure the protection of certain natural resources.

4.3 Protective measures and means of implementing them

The following instruments provide for the legal protection of the Park :

4.3.1 The Nature Conservation Ordinance (Natal) No. 15 of 1974

This Ordinance is a Provincial authority legislative enactment in terms of which the Natal Parks Board was created and was charged with the responsibility for the conservation of fauna and flora within the province of KwaZulu-Natal. This function

was developed to include the establishment of a system of protected areas, law enforcement necessary for the protection and sustainable use of the province's fauna and flora, the provision of visitor facilities and accommodation in protected areas, the promotion of public awareness of nature conservation, and the provision of scientific advice for the management of biological resources.

4.3.2 The KwaZulu-Natal Nature Conservation Management Act No. 9 of 1997

This legislation replaces certain sections of the Nature Conservation Ordinance (Natal) and provides for the institutional structures for nature conservation in the province and the establishment of control and monitoring bodies and mechanisms. The administration of the act falls under the minister responsible for the protection and conservation of the environment and nature conservation. This minister is also responsible for nature conservation policy, the implementation of the act, and the proclamation of protected areas. The Act establishes a decision-making body in the form of the KwaZulu-Natal Nature Conservation Board having the primary functions of (i) directing the management of nature conservation, protected areas, the development and promotion of ecotourism facilities within protected areas, and (ii) ensuring an effective Nature Conservation Service under the direction of a Chief Executive Officer. Section 5(3)(c) of the act requires that the Nature Conservation Board must ensure the protection and management of heritage resources within the protected areas according to the principles of the KwaZulu-Natal Heritage Act of 1997. All former proclaimed protected areas in KwaZulu-Natal have been listed in a Schedule to the act and include all the component areas of the Greater St Lucia Wetland Park. The Act also makes provision for local protected area boards which provide a statutory basis for the direct involvement of communities living in the area, in the decision-making for the protected area.

4.3.3 The Forest Act No. 122 of 1984

The Act protects State Forests and the plant and animal life contained therein. In terms of the powers devolved by the Minister of Water Affairs and Forestry to the then Administrator of Natal (now the Premier of KwaZulu-Natal), and through the provisions of Provincial Act No. 69 of 1986, the responsibility for conserving fauna and flora within the State Forests was assigned to the Natal Parks Board. In addition the act allows for management programmes to be established in order to restore ecologically disturbed habitats, prevent soil erosion and fire, maintain the natural genetic and species diversity, control plants and animals which are harmful to a particular area, and to provide facilities for public recreation. Also, any person is prohibited from damaging State Forests or contributing to the threat of fire. Forest officers are empowered to arrest any person who has contravened this Act and may seize such person's property.

4.3.4 The Water Act No. 54 of 1956

The provisions of the Water Act ensure that the Natal Parks Board has access to water resources of sufficient quantity and quality to enable it to fulfil its function of the conservation of fauna and flora. Also the act requires that all reasonable steps must be taken to prevent water pollution and that interference with the natural flow of rivers and streams is an offence.

4.3.5 The Environment Conservation Act No. 73 of 1989

This Act provides for the protection and controlled utilization of the environment. In particular, the act is aimed at protecting natural ecological processes against harm caused by human activities, promoting environmental education and the effective management of cultural resources, and the co-ordination of integrated environmental management programmes. Regulations in terms of this legislation published in 1997, make the undertaking of environmental impact assessments mandatory. Environmental Impact Assessments are now required for a wide variety of listed activities that have the potential to affect protected areas and the conservation of biodiversity. The act empowers the President to add any schedule containing provisions of an international convention, treaty or agreement relating to the protection of the environment which has been entered into or ratified by the South African Government. The act prohibits littering and obliges any person in control of areas to which the public have access to remove any litter. It also seeks to control noise pollution, vibration and shock.

4.3.6 The Sea Fishery Act No. 12 of 1988

The former Natal Parks Board was a constituted sea fishery inspectorate. Staff were appointed as sea fishery inspectors/officers function to protect the marine life along KwaZulu-Natal's coastal waters seaward of the low water mark. In the same way as the Nature Conservation Management Act charges the KwaZulu-Natal Nature Conservation Service with the responsibility to protect and conserve the province's terrestrial fauna and flora, so the Sea Fishery Act confers a responsibility for the protection and conservation of marine biota.

4.3.7 The Sea Shore Act No. 21 of 1935

In terms of this Act the KwaZulu-Natal Nature Conservation Service is a designated "local authority". Local authorities have the responsibility of conserving marine life between the low water mark and the high water mark, including tidal lagoons and estuaries along the KwaZulu-Natal coast. Similar protection, supervisory and law enforcement functions apply.

4.3.8 White Paper on a National Environmental Policy for South Africa

The principles and objectives of the Environment Policy were published as a Government White Paper. These policies ensure the protection and/or sustainable utilization of all natural resources in the country and also supports ratification of international conservation conventions including the designation of World Heritage Site properties and the conservation of biodiversity.

4.3.9 White Paper on the Conservation and Sustainable Use of South Africa's Biodiversity

As a party to the United Nations Convention on Biological Diversity, South Africa is obliged to ensure that the agreement is implemented in accordance with its objectives as well as to develop national strategies, plans or programmes to address the conservation and sustainable use of biodiversity into policies and plans. The Department of Environmental Affairs and Tourism has undertaken a consultative

process which ultimately resulted in the publication of the government's White Paper on the conservation and sustainable use of the country's biological diversity. In addition to defining biodiversity policy and strategy, the White Paper also states the vision, mission and principles which guide the policy and strategy as well as its implementation.

4.3.10 New Water Law

The White Paper on a National Water Policy for South Africa (April 1997) sets out in Section 5.2 as priority, a reserve for environmental requirements to protect ecosystems that underpin the country's present and future water resources. It is identified as a duty of the national Government to assess the needs of the Environmental Reserve and to make sure that this amount of water, of an appropriate quality, is set aside. Further, measures are identified for effective protection of water resources, that is, resource-directed measures (protection classification system and controls) which set objectives for the desired level of protection, and source-directed controls which aim to control the impacts of activities on the water resource (Section 6.3). With the adoption of the White Paper a process of consultation was followed. A new national Water Bill has been prepared. These developments are particularly important as they will ensure that an adequate supply and quality of fresh water for the maintenance of Lake St Lucia will be reserved from all its catchments.

4.3.11 Wetlands Bill

A draft Wetlands Bill has been prepared by the national Department of Environmental Affairs and Tourism. This proposed legislation provides protection for wetland systems and incorporates the provisions of the Convention on Wetlands of International Importance (Ramsar Convention) into South African law.

4.3.12 Policies for nature conservation in KwaZulu-Natal

Given the recent amalgamation of the former Natal Parks Board and Department of Nature Conservation to form the KwaZulu-Natal Nature Conservation Service, it is important that there is a vision and policies that would guide the new organization. The vision and the policies of the former Natal Parks Board have continued to operate, although it may be expected that these would be revised. However it is believed that there would be no fundamental changes in the meaning or object of either the vision or the policies.

The vision is the long term conservation of the indigenous biodiversity of KwaZulu-Natal in such a manner that the people of KwaZulu-Natal and of South Africa will benefit from and share in the diversity, economic value and opportunities for spiritual well-being and recreation which it offers. The policies that pertain to the conservation management of the Park are explicitly described in the Mission Statement of the former Natal Parks Board.

The Mission is :

TO CONSERVE THE INDIGENOUS BIODIVERSITY OF KWAZULU-NATAL, WHICH INCLUDES THE LANDSCAPES, ECOSYSTEMS AND PROCESSES UPON WHICH IT DEPENDS, AND TO ASSIST ALL PEOPLE IN ENSURING THE SUSTAINABLE USE OF

THE BIOSPHERE.

Where:

To conserve means to ensure the survival of indigenous fauna, flora and natural ecosystems and the promotion of public environmental awareness,

Biodiversity means the wealth of life on Earth, including the millions of different animal and plant types, the genes they contain and the communities, ecosystems and landscapes of which they are a part,

KwaZulu-Natal means the province of KwaZulu-Natal and adjacent territorial waters,

Sustainable use means use, either consumptive or non-consumptive which will maintain biological diversity and ensure its long term survival for the equitable benefit of current and future generations,

Biosphere means that part of the Earth which sustains living organisms,

To achieve the above mission, the KwaZulu-Natal Nature Conservation Service must :

- a) promote awareness of the functioning and importance of the biosphere;
- b) prevent the human-induced extinction of any species indigenous to KwaZulu-Natal;
- c) Promote the conservation of biodiversity and ecological processes in KwaZulu-Natal and ensure the conservation of biodiversity and ecological processes in protected areas administered by the Board and other areas where nature conservation is a declared goal;
- d) promote the sustainable and equitable use of wildlife resources in KwaZulu-Natal and exercise control in order to ensure that all forms of use are sustainable and equitable;
- e) facilitate public access to protected areas and provide appropriate services including opportunities for education and scientific study;
- f) Participate in KwaZulu-Natal's ecotourism industry by providing visitor facilities and experiences in protected areas, on a self funding basis and which are compatible with the Board's Mission;
- g) Conduct its activities effectively and efficiently through appropriately skilled people dedicated to service and committed to nature conservation;
- h) Ensure the social, economic and environmental integration of protected areas locally, sub-regionally, and regionally;
- i) Foster sustainable living through the economic and social development of communities, especially adjacent to protected areas;

In the pursuit of its mission, and the realisation of its objectives,

The KwaZulu-Natal Nature Conservation Service understands :

- that the State provides funding and legislative support for the conservation of wildlife resources and the promotion of public environmental awareness in KwaZulu-Natal.

The KwaZulu-Natal Nature Conservation Service recognises :

- that the long-term survival of Man depends on universal acceptance and understanding of the need for natural life-support systems to operate at sustainable levels ;
- that the provision of natural resource-based recreation and opportunities for spiritual fulfilment in protected areas, accessible to all who desire to use them, is an indispensable contribution towards increasing public awareness of the importance of environmental conservation ;
- that formal environmental conservation agencies have a leading role to play in developing an awareness and understanding of, and sensitivity to, the protection and management of the Biosphere ; and
- that, as the statutory custodian of the wildlife resources in KwaZulu-Natal, it also has a wider role to play through the support of local, regional, national and international nature conservation endeavours.

The KwaZulu-Natal Nature Conservation Service acknowledges :

- that it holds in trust, for the benefit of all the people of KwaZulu-Natal and of South Africa, the protected areas over which it exercises custodianship ;
- the IUCN World Conservation Strategy, expresses its support for its guidelines and undertakes actively to support international conservation by espousing the principles and endeavours of the World Conservation Union and its Commissions;
- that South Africa is a signatory to CITES, and accepts its role as the management authority for CITES in KwaZulu-Natal ;
- the role of the Department of Environmental Affairs and Tourism in nature and environmental conservation in South Africa.

The KwaZulu-Natal Nature Conservation Service :

- pledges its co-operation to all other local, regional, national and international nature and environmental conservation authorities ;
- confirms its commitment to, and support for the communities and public services and with whom it interacts ; and

- dedicates its staff to the fulfilment of its mission.

The core strategies developed in order to achieve the Mission are:

(i) Universal acceptance of the value of nature conservation

Objectives :-

- * to use nature conservation as a basis for environmental education and awareness programmes, and to promote environmental ethics ;
- * to demonstrate the aesthetic values and economic contributions of nature conservation and eco-tourism ;
- * to expand the diversity and enhance the quality of products and services ;
- * to build powerful alliances.

(ii) Contribution to social stability and economic development in the region

Objectives :-

- * to support, promote and develop eco-tourism as an industry ;
- * to support, promote and develop sustainable use of wildlife ;
- * to use formally protected areas as a catalyst for development, especially in rural areas, through:
 - encouraging infra structural development
 - stimulating local entrepreneurship ;
 - empowerment of local communities through training and transfer of skills;
 - initiating and supporting local community projects ;
 - optimising local employment opportunities ;
 - seeking and channelling funds to address community needs

(iii) Adequate financial resources

Objectives :-

- * to ensure that the State recognises nature conservation as a foundation of economic development and provides adequate subsidisation;
- * to use the annual Provincial subsidy effectively and efficiently in the best interest of nature conservation ;
- * to generate additional funds through joint ventures, sponsorships, donations and contributions;
- * to support actively the all Trusts, established to assist the KwaZulu-Natal Nature Conservation Service in meeting its conservation responsibilities ;
- * to generate international financial support ;

- * efficient management of assets and resources

(iv) Provincial, parastatal nature conservation structure for the management of integrated nature conservation activities throughout KwaZulu-Natal

Objectives :-

- * demonstrate the effectiveness, flexibility and success factors of the KwaZulu-Natal Nature Conservation Service as a Provincial parastatal nature conservation agency;
- * demonstrate competence, expertise, credibility and effectiveness at local, regional, national and international level;
- * to demonstrate relevance and commitment to and knowledge of KwaZulu-Natal

(v) Shared vision and commitment throughout the organisation and the executive Board

Objectives :-

- * pursue the appointment of a well- balanced executive Board with representation of appropriate skills and knowledge;
- * to recruit, develop and retain competent, skilled and committed staff;
- * to ensure effective internal communication;
- * to empower and uplift staff from disadvantaged backgrounds to enable them to fulfil their potential;
- * to pursue participatory management practices.

(vi) Excellence of products & services

Objectives :-

- * define all communities and related products, services and processes;
 - identify the communities with which the KwaZulu-Natal Nature Conservation Service engages, and co-define their needs and the expectations;
 - define the KwaZulu-Natal Nature Conservation Service's role in engaging with all communities, and the processes of engagement;
 - define the specific role of the KwaZulu-Natal Nature Conservation Service in the business sector;
 - evaluate trends in the community including size, growth, development , revenue, distribution channels, cost structure and key success factors;

- to identify and understand emerging opportunities and constraints including ecological, social, political, administrative, economic and technological factors.
- address community needs.
- provide the widest diversity of products and services given the available resources.
- advertise these products & services.
- ensure efficiency in the offering , allocating and accounting for products & services.
- ensure timely response to requests & demands.
- minimize the costs of offering and delivering products & services.
- maximize the availability of products & services.

It is considered that a significant contribution to the recognition of nature conservation has already been made. KwaZulu-Natal has a rich biodiversity conserve d through an extensive system of protected areas a nd conservation orientated private sector management systems such as Conservancies and Biosphere Reserves. It is the KwaZulu-Natal Nature Conservation Service's firm conviction that a regional nature conservation agency with statutory autonomy, a system already proven in South Africa and aspired to by other countries such as Kenya and Zimbabwe, is the best guarantee of the most rapid achievement of the vision.

4.4 Agency(ies) with management authority

The KwaZulu-Natal Nature Conservation Service is currently the agency responsible for the control of the Park. This mandate is carried out in collaboration with the KwaZulu-Natal Provincial Administration and in accordance with legislation at national and provincial levels.

4.5 Level at which management is exercised

Management of the Park is currently exercised at the provincial level by the KwaZulu - Natal Nature Conservation Service. The annual budget is allocated by the KZN Provincial Legislature. The responsible officer who is accountable to the Minister of Traditional and Environmental Affairs is the Acting Chief Executive Officer, Dr G.R. Hughes who is empowered to take the day to day decisions, which he does in consultation with his executive staff representing three Branches, namely Conservation (with four sub-directorates), Scientific Services (with three sub-directorates), and Administration (with three sub-directorates). All major decisions, including those of policy, are taken by the KwaZulu-Natal Nature Conservation Board, the appointment of which by the Minister is imminent. The KwaZulu-Natal Nature Conservation Board is the successor in title to the Natal Parks Board.

In addition to the primary conservation functions, staff are also employed to undertake support functions such as construction, planning, public relations, secretarial services, accounting and accommodation bookings.

4.6 Agreed plans related to property

4.6.1 Regional planning initiatives

Existing land uses in the region in which the Park is situated consist of formal and informal agriculture and forestry, nature conservation and ecotourism, and mining. Ecotourism is a significant and important industry, because of the appeal of the high quality of the resource base provided by the natural environments to visitors (Parris *et al.*, 1992). It is likely to become an increasingly important form of sustainable land-use in the region.

The KwaZulu-Natal provincial authorities are in the process of compiling a regional structure plan which would provide a development framework and policy guidelines for the control of development in the region in which the Park is situated. This region is largely under-developed, being relatively densely populated by a majority of poor people. Unemployment levels are therefore high. The plan aims at an appropriate mix of land uses to accommodate both environmental concerns as well as development needs. Ecotourism is recognised as one of the more attractive development options, because of an anticipated escalation in the growth of the ecotourism market, and because of the sustainable nature of nature conservation as an appropriate land use in sensitive natural environments. Ecotourism and nature conservation are seen to be a labour intensive industry with the potential to provide employment and other benefits to neighbouring impoverished rural communities. In this and other respects, it is expected that support for upholding the integrity of the Park will be provided by this plan.

In addition to the structure planning initiative, the KwaZulu-Natal provincial government is undertaking a multi-stakeholder planning initiative for the Richards Bay -Maputo corridor area known as the Lubombo Spatial Development Initiative (Lubombo SDI). Planning will promote the further development of agriculture and tourism in this area. The St Lucia region has been identified as a core node where anchor tourism development projects can be located. Such projects are of critical importance for the generation of employment, the local economy, and social upliftment of rural people as part of a strategy to alleviate poverty in the region and conserve the natural resource base. Tourism development is therefore largely based on protected areas that are either State, private and communally owned.

4.6.2 Programmes for the rehabilitation of modified areas and the improved supply of fresh water

Several initiatives have been undertaken to rehabilitate areas that were under plantations or invaded by alien plant species and thus also re-establish the natural hydrological regime. These programmes are:

(i) Removal of Plantations

The programme for the removal of plantations of exotic trees from the Eastern Shores is ahead of schedule with more than 30% of the 5 000ha having been removed and rehabilitated. The programme is expected to have been completed within the next 10 - 15 years.

(ii) Working for Water Programme

This is a nationally funded programme by the Department of Water Affairs and Forestry for the removal of alien plant infestations from important water producing catchment areas in South Africa. The programme was initiated in the St Lucia region in late 1995. It is managed by the KwaZulu-Natal Nature Conservation Service on the Eastern Shores where more than 11 000 ha of conservation land has been cleared of self-seeded alien trees and plants including follow-up treatments of areas previously under plantations. The programme is to be expanded into other areas of the Park including the Mkuzi Game Reserve section. The South African Forestry Company (SAFCOL) are undertaking the programme on the western shores and have removed infestations of alien trees from the banks of rivers feeding the lake such as the Mpati.

(iii) Allocation of water for Lake St Lucia

Several technical workshops under the auspices of the KwaZulu-Natal Nature Conservation Service, Department of Water Affairs and Forestry and the Department of Environmental Affairs and Tourism have been held to model the fresh water requirements from the catchment for Lake St Lucia given demands for water from other users.

4.6.3 Integrated Development Planning

To ensure that decisions regarding land-use planning are complementary and environmentally sustainable, an integrated planning and development process convened by the Nature Conservation Service is currently being undertaken. The process enables various sectors and stakeholders to work towards the common goal of eradicating the region's poverty and promoting sustainable development.

Concept development plans for component areas of the Park (Eastern Shores, Dukuduku, Cape Vidal) have been prepared by the KwaZulu-Natal Nature Conservation Service. The effect of the land claims has been to freeze tourism development in these areas. Plans include the development of new rest camps (varying in size from 8 to 200 beds) and a system of game-viewing roads as well as the expansion of existing facilities in established rest camps. A four-day overnight hiking trail, the Emoyeni Trail, has been established and is being operated on the Eastern Shores.

4.6.4 Extended Community Conservation Programme

The KwaZulu-Natal Nature Conservation Service, with funding provided by the Green Trust, a subsidiary of WWF-SA, has instituted a comprehensive community conservation programme for the whole of the Greater St Lucia Wetland Park. A team of community conservation officers has established partnership forums with all local communities and interest groups to co-define and develop a sustainable relationship with the protected area and to integrate conservation and sustainable development programmes.

4.7 Sources and levels of finance

The headquarters of the KwaZulu-Natal Nature Conservation Service is situated in Pietermaritzburg from where it administers 103 protected areas with a total area of approximately 7 682,72 km². The KwaZulu-Natal Nature Conservation Service is a semi-autonomous and non-profit making organisation, partly funded (approximately <60% of total receipts) by the KwaZulu-Natal Provincial Legislature. The balance is from revenue earned through fees, charges for accommodation, sale of curios and other sources of income, which accrue to the Service's account. Some 3 400 people were employed by the former Natal Parks Board which earned R90 429 942 during the 1997/98 financial year. Following amalgamation the number of staff currently employed is 4 300.

4.8 Sources of expertise and training

The staff of the KwaZulu-Natal Nature Conservation Service is skilled and highly trained in a variety of fields such as wildlife management, protected area administration, the natural sciences, financial and tourism management, the provision of secretarial and construction services. In addition to its own staff resources, the KwaZulu-Natal Nature Conservation Service is able to draw on both local and international experts located at universities or other government and non-government institutions for advice and assistance. In-house training is provided and a large variety of courses are made available to staff every year.

4.9 Visitor facilities and statistics

There are ten entrance gates to the Park. Members of the public enter either as day visitors, or as overnight visitors who make use of accommodation or camping facilities. The Park can currently accommodate 5736 persons per night. In addition, almost 2000 beds are provided by private enterprise in St Lucia Estuary village, and on privately owned game-ranches adjacent to the Park. It is estimated that approximately one million visitors enter the Park each year.

Access to the recreational opportunities of the Park via wilderness trails and guided walks, vehicle and boat tours is provided. Access to and diving on the coral reefs is controlled via diving concessionaires. Visitors also use a network of roads for game-viewing from their private vehicles.

The non-consumptive use of the area is encouraged. Activities permitted are:

- * game-viewing, bird-watching and turtle viewing, from vehicles and boats, with or without guides;
- * beach leisure activities (e.g. swimming, snorkelling, scuba-diving, walking, driving);
- * day-walks and overnight hiking;
- * camping, caravanning, and accommodation in chalets and bush-camps;
- * religious activities (e.g. mass baptism).

4.10 Property management plan and statement of objectives

The following management plans have been compiled by the KwaZulu-Natal Nature Conservation Service : Master Plan for the Greater St Lucia Wetland Park, Mkuzi Game Reserve Management Plan, and St Lucia Marine Reserve Management Plan. In addition, management plans for seven other component areas of the Park are in preparation. These are for False Bay, Western Shores, Lake and islands, Eastern Shores, Tewate Wilderness Area, Sodwana and the Maputaland Marine Reserve (to be amalgamated with the plan for the St Lucia Marine Reserve).

An ecotourism zonation system for the Park (Figure 3) makes provision for the control of ecotourism in the area. Three ecotourism use-zones are recognised:

- (i) The **low intensity use zone** is the wilderness core of the Park, consisting of terrestrial, aquatic and marine components. Within this zone, visitors have a high probability of experiencing solitude, tranquillity, self-reliance, challenge and risk, in an unmodified natural environment. Access is on foot with the exception of short-term controlled access by limited numbers of vehicles in the intertidal zone between Leven Point and Ochre Hill, and by sea craft in the marine wilderness. No permanent buildings or signs are permitted.
- (ii) The **moderate use zone** provides visitors with opportunities to enjoy wildlife in a natural setting and to encourage a feeling of independence with low interaction levels between users. Visitors experience a natural area, largely unmodified except for roads, and small, widely dispersed development nodes, where self-catering accommodation is provided. Provision is made for motorised access on unsurfaced roads, self-guided trails, and bird and game viewing hides.
- (iii) In the **high intensity use zones** the natural environment has been modified to include surfaced roads and facilities in development nodes. There is direct access to the moderate use zone, and visitors will encounter other users. A range of accommodation and other facilities is provided at a range of spatial intensities and various levels of sophistication. Interpretive facilities consist of comprehensive educational displays. Guided walks and trails for nature appreciation are provided both within and outside of these development nodes.

4.11 Staffing levels

Staff stationed within the Park are responsible either for implementing wildlife management programmes, the management of visitor facilities, the provision of environmental awareness programmes, or for undertaking research and monitoring projects. The responsibility for administering the Park lies with the Chief Conservator., whose staff are responsible for nature conservation and management in the area. Staff are located at eight administrative centres (Sodwana Bay, Cape Vidal, St Lucia Estuary, False bay, Mantuma, Fanie's Island, Charter's Creek and Mapelane) and four management outposts (Mtshope, Madola, Bhanga Nek and Mission Rocks). In addition scientific staff are stationed at Mantuma and St Lucia

Estuary, and a research station for outside workers also operates at Sodwana Bay. A crocodile breeding station and interpretative centre is situated near the town of St Lucia Estuary. The total staff complement numbers 674 permanent and part-time employees.

5. FACTORS AFFECTING THE PROPERTY

5.1 Development pressures

Threats which potentially affect the integrity of the ecological functioning of the Park include:

- * possible land use changes within certain Park component areas; and
- * a reduction in the supply of critical resources.

The earliest identified threat was the possible closure of the St Lucia estuary mouth by sedimentation. The threat arose from the transformation of the upper portion of the Mfolozi Swamps by agriculture. Large levees were constructed along the banks of the Mfolozi River for flood protection, particularly for sugar-cane growers. This allowed for the sediments carried by the river to be deposited in the in-shore environment immediately to the south of the St Lucia estuary. The north flowing in-shore current then moved these sediments into the mouth of the estuary, causing the temporary closure of the mouth. This threat has been managed by the Natal Parks Board since 1957 using a dredging operation, according to nature-based guidelines (Wright, 1990, Wright & Masson, 1993).

The threat of an inadequate amount of fresh water supplied by the feeder rivers to Lake St Lucia is longstanding and arises from the possibility of additional dam construction or increased levels of water abstraction within the catchments of these systems. The South African Government's Kriel Commission of Enquiry made recommendations concerning this threat as long ago as 1966, but the implementation of important recommendations was delayed until recently. The policy of the South African Government and the Department of Water Affairs and Forestry is to ensure adequate supplies of water to users, including the natural environment. This has been included in the draft Water Law which ensures an amount of water, referred to as the ecological reserve, to maintain the natural environment. A recent multi-disciplinary workshop jointly organised by the Department of Water Affairs and Forestry and the Natal Parks Board, sought to determine the amount of water required for the maintenance of the Lake (Taylor, 1993). Current rates of water abstraction are relatively low and possibly not significant. No large water storage dams have been built, although there are two medium-sized dams in the upper reaches of the White Mfolozi and Hluhluwe rivers. Nevertheless, future research will be required in order to ensure that supplies of freshwater are adequate for the Lake.

Plantations of the alien pine *Pinus elliottii* and *Eucalyptus spp.* had been established in the region over a period of about 35 years since the mid 1950's. Although the more intensively planted areas were situated to the west of the Park, an area of approximately 5000 ha was established in the Eastern Shores State Forest component area. Prior to the incorporation of this area into the Park, the decision was taken by Government authorities in 1989 to halt the establishment programme

on the Eastern Shores, and to phase out the existing plantations as they are harvested (Stubbings & Venter, 1992). Areas which have since been clear-felled or where infestations of alien plants have been eradicated show marked re-colonization by natural vegetation, although follow-up treatment programmes will be necessary. It is anticipated that the application of management programmes in the restoration of former plantations will result in the area once again supporting natural assemblages of plants and animals.

In 1972 and 1976, prospecting rights were granted by the Department of Mineral and Energy Affairs to a private mining company for an area of 3 460 ha within the coastal dune system of the Eastern Shores component of the Park. Results showed a large deposit of ilmenite (a titanium ore) to be present, which resulted in an application for a mining lease in 1988. A large number of environmental concerns and objections to mining were identified by interested and affected parties, including the Natal Parks Board, and these were brought to the attention of the South African Government. The Government instructed that an environmental impact assessment be undertaken to investigate two alternative land uses for the Eastern Shores, namely nature conservation and tourism, or mining with nature conservation and tourism (CSIR, 1993b). The recommendation of the independent Review Panel appointed by the government to reach a decision was that there should be no mining anywhere in the Greater St Lucia area, and this decision was ratified by Cabinet on 6 March 1996.

The context of the Park within a region where there are many impoverished communities has resulted in several claims for land in the Park. This question was addressed by the Review Panel appointed to reach a conclusion on the mining option on the Eastern Shores. The Review Panel concluded that the ecotourism land-use option had more potential to generate opportunities for economic development in the sub-region, than any other land-use, including the resettlement of any land within the Park (Leon, *et al.*, 1993). Although this is a matter which still requires resolution, there is a need for local communities to be involved in the management of the Park, and to derive direct benefits from its resources and the opportunities which it provides.

Land claims have been registered by the Commission on Restitution of Land Rights for component areas of the Greater St Lucia Wetland Park and notice to this effect has been published in the South African Government Gazette. The areas are the Eastern Shores State Forest, Cape Vidal State Forest and Sodwana State Forest. In view of these areas being State-owned, the national Department of Land Affairs is the respondent and therefore has a similar role to that of any other land owner but this may differ in that the State is constitutionally and politically committed to land restitution. Thus the Department of Land Affairs is a direct stakeholder in the negotiating process and may express itself on any aspect of the claim and/or propose alternative solutions. The KwaZulu-Natal Nature Conservation Service has given written notice in terms of the Restitution of Land Rights Act 22 of 1994 to the Commission that it is an interested party in this matter. In addition the KwaZulu-Natal Nature Conservation Service has submitted that it will not oppose restitution, but recommends a basis for negotiating a settlement of the matter between the State and the claimants which does not include restoration of the claimed areas, but will address the needs of the claimant through a variety of models for integrated

conservation and development.

The Land Claims Commissioner is reaching the point of finalization with regard to the claim against the Eastern Shores State Forest and will be presenting the draft settlement options to the claimants and the Department of Land Affairs. The report will then be submitted to the Land Claims Court and at this point all interested parties will be able to engage in the settlement process.

There is a possibility that if restoration of part of the whole area claimed is granted by the Land Claims Court, there would follow a change in either the boundaries or the zonation of the nominated site. This may affect the buffer and strict protection zoned areas (see Figure 3 where these are indicated as either moderate [buffer] or low [strict protection] use zones). However, much progress has been made towards the establishment of Biosphere Reserve areas adjacent and to the west of the Park, in particular the Southern Maputaland Biosphere Reserve (being approximately 500 000 ha in extent) and Northern Maputaland Biosphere Reserve. Land-uses within these possible Biosphere Reserve areas comprise extensive areas that are either nature conservation or traditional/cultural and this would therefore result in an extension of the buffer zones for the Park.

5.2 Environmental pressures

Possibly the most serious threat is from alien invasive plants, although the area currently affected by such invasions is limited. Principal threats are posed by *Chromolaena odorata*, *Psidium guajava*, *Pereckia aculeata* and *Melia azedarach*. Management programmes which have been in operation for several decades are aimed at the elimination of all infestations within the Park. In addition, the efforts of the Plant Protection Research Institute to identify and establish a spectrum of biological control agents are supported and implemented in the Park.

Offshore spills from oil tankers could cause pollution damage to the marine and estuarine environment. Mechanisms are in place along the entire South African coastline to manage oil spills arising from tanker accidents at sea. The oil spill from the tanker Katina P. in 1992 entered the northern area of the Park and was successfully confined and dissipated without serious adverse effects on marine life.

5.3 Natural disasters and preparedness

No natural disasters are foreseen that would have the potential to threaten the property. Floods and droughts are considered to be part of the natural forces that have operated over the past millennia.

5.4 Visitor/tourism pressures

As stated elsewhere, the Park caters for a broad spectrum of visitors involved in a wide variety of recreational activities. Conceptual development plans guide the development of visitor facilities, and decision-making is guided and legally regulated by an integrated environmental management procedure, incorporating environmental impact assessment, environmental auditing and independent review. The Greater S t

Lucia Wetland Park Integrated Development, currently in preparation, will determine the nature and scale of future development in the Park measured against criteria of environmental, social and economic sustainability.

Visitor access to this Park is controlled and managed by the Nature Conservation Service or through concessions. Visitor management forms a key component of management plans and of management meetings where decision-making is characterised by a thorough consideration of all relevant information.

5.5 Number of inhabitants within Property and buffer zone

With the exception of the Coastal Forest Reserve component of the Park, no private persons occupy the area. Within the Coastal Forest Reserve there are six small private townships (these are; Enkovukeni, Kwa Dapha, Mqobela, Mbila, Shazibe, and Hlabezimhlophe) having a combined total population of approximately 200 families. Also private townships (Makakatana and St Lucia Estuary) occur as enclaves to the Park, but are not part of the nominated site.

5.6 Other

Sustainable consumptive use of certain natural products is permitted. Included are:

- * harvesting of various plant species and plant parts for construction, medicinal, food, or firewood purposes;
- * the removal of certain surplus large herbivores, for translocation to other conservation areas, or to supply meat for human consumption;
- * the collection of marine invertebrates for human consumption;
- * recreational and artisanal fishing, in Lake St Lucia, Lake Sibayi, the Kosi lake system and in the sea (excluding the marine wilderness area);
- * prawn-netting in Lake St Lucia for use as fishing bait;
- * controlled hunting of certain large herbivores in the Mkuzi Controlled Hunting Area;
- * the limited harvesting of wild-laid crocodile eggs for breeding and restocking purposes.

6. MONITORING

6.1 Key indicators for measuring state of conservation

Key components of both the physical and biotic environment of the Park are monitored in order to determine the ecological state of the natural systems and to determine trends and changes over time. In terms of monitoring of climate, daily records of rainfall, maximum and minimum temperatures, and evaporation (Symond's pan) are made at all major stations except for the monitoring of evaporation which is done at Charters Creek. Continuous records of wind and sea temperatures (Oceanographic Research Institute) are made. Unusual climatic events are recorded and rainfall records analysed to determine deviation from mean rainfall. Evaporation data is used together with rainfall and lake level records in order to explain hydrological responses in Lake St Lucia. Continuous record of water level in Lake St Lucia is measured at several localities and is a key determinant of the lake ecosystem especially for wading birds. Salinity (ppt) of the water in Lake St Lucia is measured monthly at several points and is possibly the single most important determinant of the state of the lake ecosystem, that is, with salinity, lake level, season, and the period of time since the last "re-setting" it is possible to make predictions and assumptions on the biological state of the lake ecosystem. Changes in the state of the St Lucia estuary mouth are recorded, and this together with the above information as well as river run-off data is synthesised in the St Lucia hydrological model. Cross-section measurements of Lake St Lucia are undertaken by the Department of Water Affairs and Forestry every five years in order to detect rates of sediment accumulation and changes in volume.

With regard to the monitoring of the biota in Lake St Lucia, qualitative records are made on aquatic vegetation, and notes on the abundance of jellyfish, a key-stone species, are made. Fish are monitored once every three months at three sites using nets of two mesh sizes. A total count, numbers of different species and the distribution of birds on Lake St Lucia is done every three months. Numbers of crocodiles and hippopotamus and their distribution are also recorded. In addition nesting success for colonial breeding birds and the number of crocodile and turtle nests are recorded. Within terrestrial areas annual game censuses are undertaken, species and cause of mortality recorded, as well as the number of sightings of rare species. The numbers of any animal species re-introduced to an area is recorded. Vegetation is monitored using fixed-point photography, the annual mapping of areas burnt, and in Mkuzi Game Reserve annual range condition assessments are undertaken using a plot method. On the coast the number and species of beach strandings are recorded.

Monitoring of consumptive use of natural products is undertaken. Areas and the amount in kilograms are estimated and recorded for off-take of reeds (including *Phragmites*) and grass at harvest time. All angler catches are monitored using a catch card return system and the full catch of fish caught by gill netting is recorded daily. This has provided information on catch per unit effort as well as identifying the species being targeted. The number and species of all bill fish caught by anglers are recorded. Monitoring of intertidal harvesting (species and mass in kg, gathering effort

and catch per unit mass) and the number of users is also undertaken.

In term of management actions undertaken by staff in the various component areas of the Park several activities are monitored, including the areas, species and treatments of alien plant infestations, the areas and sites of soil erosion reclamation, the species and numbers of animals removed or culled as part of population control programmes, as well as the species and numbers of animal poached.

6.2 Administrative arrangements for monitoring the property

Staff within each component area of the Park are required annually to review the management programmes (including research and monitoring programmes) which stem from the protected area management plan that were undertaken during the previous reporting year and formulate their programmes for the current year. Management goals are set and reported on in the following year. These programmes are tailored according to resource (budgets, staff, and time) availability. A detailed annual report is compiled for each component protected area which collectively form a document called the yearbook. The yearbooks are used for compiling the annual report of the KwaZulu-Natal Nature Conservation Service which is submitted to the Minister and members of the provincial legislature.

6.3 Results of previous reporting exercises

The results of monitoring and reporting are contained in a long series of yearbooks for the respective past financial years. These are housed in the library at the headquarters in Pietermaritzburg and at stations in the KwaZulu-Natal Nature Conservation Service. The results are used to up-date management plans, formulate future management programmes or actions as well as monitoring and or research programmes.

7. DOCUMENTATION

7.1 Photographs

A collection of slides has been provided (attached) and several of these have been selected to illustrate this document. In addition, two short films prepared for the South African Broadcasting Corporation, on sea turtles and on the Park have been included as supplementary visual material.

7.2 Management plans

Three management plans have been included as part of the documentation, these are:

- Appendix 4 - Mkuzi Game Reserve Management Plan
- Appendix 5 - Greater St. Lucia Wetland Park Master Management Plan
- Appendix 6 - Kosi Bay/Coastal Forest reserve Management Plan

In addition a booklet entitled "the Greater St Lucia Wetland Park" by R H Taylor has been included.

7.3 Bibliography

A listing of references cited in the text is provided as Appendix 1. Bibliographies for components of the Park are provided as Appendices 2, 3 and 4.

7.4 Address where inventories and records are held

Records are kept at both the headquarters and at the offices at St Lucia Estuary. All correspondence should be addressed to :

Chief Executive Officer
KwaZulu-Natal Nature Conservation Service
P O Box 662
PIETERMARITZBURG
3240
SOUTH AFRICA

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WORLD HERITAGE NOMINATION - IUCN TECHNICAL EVALUATION

GREATER ST. LUCIA WETLAND PARK (SOUTH AFRICA)

1. DOCUMENTATION

- i) **IUCN/WCMC Datasheet:** (no references)
- ii) **Additional Literature Consulted:** Lubombo Spatial Development Initiative. n.d. 44p.; Bird, E.C. 1968. **Coasts**. MIT Press; Heydorn A.E.F. 1989. The Conservation Status of Southern African Estuaries, *in* Huntley, B.J. **Biotic Diversity in Southern Africa**. O.U.P.; Hockey P. and C.D. Buxton. 1989. Conserving Biotic Diversity on Southern Africa's Coastline *in*. *ibid*; Hughes, R.H. and J.S. Hughes. 1992. **A Directory of African Wetlands**. IUCN/UNEP/WCMC; Begg, G. 1978. **The Estuaries of Natal**. Town and Country Planning Commission. Natal. 657p.; Sheppard C. and S. Wells. 1988. **Coral Reefs of the World**. Vol.2. IUCN/UNEP; MacKinnon, J. & K. 1986. **Review of the P.A. System in the Afrotropical Realm**. IUCN/UNEP; Stuart S. et al. 1990. **Biodiversity in Sub-saharan Africa**. IUCN. 242p.; Ramsar Convention. 1992. St. Lucia System. Monitoring Procedure Report 28; Ramsar Bureau. Various dates. Information Sheets on Ramsar Wetlands in South Africa; Davis S. ed. **Centres of Plant Diversity**. Vol1. IUCN/WWF; Taylor, R.H. 1993. Proceedings of the Workshop on Water Requirements for St. Lucia. Dept. Environmental Affairs, 83p.; Kyle, R. 1999. Factsheet on Resource Utilisation in Kosi Bay. KZDNC. 12p.
- iii) **Consultations:** Federal and Provincial Park Agency representatives
- iv) **Field Visit:** January 1999. Jim Thorsell.

2. SUMMARY OF NATURAL VALUES

The Greater St. Lucia Wetland Park (GSL) is located along the north-eastern coast of Kwazulu-Natal Province in South Africa. The park system extends from the Mozambique border for almost 220km south to Cape St. Lucia. Width of the land portion of the coastal strip varies from 1km to 24km. A marine reserve component 5km wide extends 155km along the length of the coast. The GSL consists of 13 separate but contiguous conservation units totalling 239,566ha. The area has a subtropical climate affected along the coast by the Agulhas oceanic current. A number of river systems flow into the park and have their catchments outside GSL in the Lubombo Mountains. A rich source of marine fossils occur in upper cretaceous sediments that help explain the Gondwana relationships of the site. Five ecosystems are found in GSL:

- ◆ the marine ecosystem characterised by a warm sea, the southernmost extension of coral reefs in Africa, submarine canyons and long sandy beaches;
- ◆ the coastal dune system consisting of linear dunes up to 183m in height, sub-tropical forests, grassy plains and wetlands;
- ◆ lake systems consisting of 2 estuarine-linked lakes (St. Lucia and Kosi) and 4 large freshwater lakes;

- ◆ the Mkuze and Mfolozi swamps with swamp forest, extensive reeds and papyrus wetlands; and
- ◆ the inland western shores with ancient shoreline terraces and dry savanna woodland.

Apart from the variety that each of these ecosystems provide to the GSL, the many ecological linkages between them have been a major attraction for research on the geomorphological and biological processes that occur there. Four RAMSAR sites are included in the GSL.

Associated with this high environmental heterogeneity is a remarkable diversity of natural biota. This is reinforced by the transitional location of GSL between the tropical and subtropical African biota and its setting within the Maputoland Centre of Endemism. The flora of GSL is diverse with 734 genera and 44 endemics recorded within its mosaic of forest/grassland/wetland and marine vegetation. The marine component is rich in species as well with 53 corals, 812 molluscs and 991 reef fishes. GSL provides home to 50 species of amphibians, 109 species of reptiles, including several that are endemic or threatened. It is also the principal southern African breeding ground of the loggerhead and leatherback turtles. Birdlife is especially diverse with 521 species and the park is a major breeding area and refuge for migratory waterfowl and waders. GSL is also known for 97 terrestrial mammal species and 32 marine mammals including dolphins and whales. Threatened species found in GSL (as listed under the CITES Convention) total 147.

3. COMPARISON WITH OTHER AREAS

There are currently 42 sites on the World Heritage list with major wetland values and 40 others that contain secondary wetland values. 40 existing World Heritage natural sites have a coastal and marine component. In Africa, the only World Heritage site comparable to GSL is the Banc d'Arguin in Mauritania which contains sandy marine and estuarine waters but does not have freshwater habitats or coral reefs. The same is true of the Arabian Oryx Sanctuary in Oman as well as the Shark Bay site in Australia, El Vizcaino in Mexico and, to a lesser extent, Donaña in Spain. None of these have the same terrestrial species complement as St. Lucia which among others has megaherbivores such as rhino and hippo and predators such as leopard. GSL has some similarities with the Fraser Island World Heritage site in Australia which has significant coastal sand dune features as well as diverse marine life including turtles, dolphins, whales and abundant fish and marine invertebrates. GSL, however, is distinct terrestrially with its range of saline and freshwater wetlands, estuaries, floodplains and savanna.

Within southern Africa, the St. Lucia system extends into Mozambique as far as the Inhaca Peninsula with swamps, freshwater lakes and coastal lagoons. (The nomination documentation notes that, recognising its transfrontier nature, an extension of the site is being discussed with the Mozambican authorities.) There are other freshwater lagoons and estuaries further north along the Mozambique coast (e.g. Inharrime R.) but these do not have the range of natural values of GSL and are not adequately protected. Other important coastal wetlands in the region are found at Walvis Bay, Cape Cross and Sandwich Harbour in Namibia but these are arid systems without the range of ecosystems and biota as found in GSL.

Within the South African Woodland/Savanna Biogeographical Province there are 389 protected areas, many of large size such as Kruger, Hwange and the Okavango complex. All of these sites are inland and do not include the significant coastal features of GSL.

Finally, along the South African coast itself, there are almost 50 coastal conservation areas (see Map), one of which (Cape Peninsula National Park) is being considered for World Heritage nomination. GSL, however, is very distinctive from all of these in that it is the largest estuarine system in Africa, the most diverse and the only area with coral reefs and with such a high number of threatened species.

Distribution of coastal conservation areas between the Orange River and Kosi Bay.

(Reserve names, sizes and conservation status are detailed in Table 1 in Hockey and Buxton, 1989.)

4. INTEGRITY

The area has a history of conservation management dating back to 1895 when the first reserves were created by the Zululand Government. The major threat to the area was a sand mining proposal which was resolved by the South African Cabinet in 1996. After lengthy public debate the decision was made to not approve titanium mining anywhere in GSL and to nominate the area for World Heritage status. The following issues relating to integrity of GSL, however, remain.

4.1. Protection of catchment area and regional development

All estuaries exist in a state of dynamic equilibrium and are places of constant interaction between humans and sea. As experience in other World Heritage wetlands has shown, human-induced changes in upstream catchments can have significant effects. Changes that have affected the GSL include upstream water abstraction, agricultural practices and road construction. These issues were addressed in a 1992 Workshop on Water Requirements for Lake St. Lucia and will be an on-going concern as development in the catchment area continues.

Recognising the economic, social and environmental linkages in the region around the GSL, the Government of South Africa, Mozambique and Swaziland have initiated the Lubombo Spatial Development Initiative (LSDI). This exercise in tri-lateral regional planning will provide another mechanism for addressing GSL's catchment issues. The GSL World Heritage nomination is thus seen in a larger context of integrated development and a regional plan and Environmental Management Framework are now being prepared.

4.2. Management Structure

Recognising the need for integration of the GSL with the LSDI and the complexity of managing the 13 component units of the nomination, the national and provincial levels of government are establishing a statutory authority for the Greater St. Lucia region. This Authority will provide a mechanism to consolidate the various conservation units under a single legal designation. Importantly, the Authority will assign management to the Kwazulu-Natal Nature Conservation Service which IUCN recognises as one of the world's most effective protected area management agencies.

4.3. Land Claims

Much of the land in the GSL is under negotiation as part of the work of the Commission on Restitution of Land Rights. Settlement of the land claims are expected to be announced soon. It is expected that these settlements will be compatible with protecting the conservation status of the area but could possibly result in boundary changes in the peripheral and buffer areas. The Bureau should note that its decision on this nomination should not prejudice the land claim negotiation process.

4.4. Resource Harvesting and Local Community Issues

Parts of the GSL are managed to allow controlled extraction of some natural resources (i.e. IUCN Protected Area Category IV). This is an important source of revenue and subsistence by people who are neighbours of the park for these resources are difficult to obtain outside the park. For example, commercial fish off-take from Lake St. Lucia is about 14,000 tons per year. In the Kosi lake system use is even more intense with monitoring reports for 1997 indicating that a wide range of products are harvested. An average daily number of 488 local people use the area and gather products totalling 1.6 mil. Rand in annual value. Close monitoring suggests that most of this use was legal and sustainable and most of it is for subsistence purposes. Other products harvested is ncema grass and reeds. Some 1500 people per day are allowed to collect this for a two-week period each June. Other permits to individuals of local tribal groups also allow to harvest marine invertebrates and thatch. Wild-laid crocodile eggs are also collected on a controlled basis.

All of the above human uses of GSL are subject to intensive management, research and monitoring. They are also confined to about a third of the total area while the remainder is free from extractive uses. With some 100,000 people in 48 tribal groups surrounding the GSL, the community conservation programmes in place are key to minimising conflicts and maximising benefits. In this regard, some funds to assist in community conservation have come from WWF but budget allocations from the Province need to ensure GSL management is adequately supported.

4.5. Restoration of degraded habitats

Like most protected areas, GSL has some problems with exotic species, including some plantation forests. Many actions are underway to control this problem but, once again, continued support from government is required. Active intervention to dredge the St. Lucia estuary is also an on-going management expense.

4.6. Boundary changes

As the nomination notes, there is action underway to establish a transfrontier site with neighbouring Mozambique as well as extend the marine reserve to align with the terrestrial component for the full length of the GSL. Both these initiatives are commendable and would benefit conservation of the area. Further additions as a result of the land claim negotiations may also arise in future. The Bureau should take note of these possible extensions.

5. ADDITIONAL COMMENTS

None.

6. APPLICATION OF WORLD HERITAGE NATURAL CRITERIA

The Greater St. Lucia Wetland Park has been nominated under all 4 World Heritage natural criteria. IUCN recommends that its case for inscription strongly rests on the following 3:

Criterion (ii): Ecological processes

The combination of fluvial, marine and aeolian processes initiated in the early Pleistocene in the GSL have resulted in a variety of landforms and continues to the present day. The park's transitional geographic location between sub-tropical and tropical Africa as well as its coastal setting has resulted in exceptional species diversity. Past speciation events in the Maputoland Centre of Endemism are also on-going and contribute another element to the diversity and interplay of evolutionary processes at work in the GSL. In the marine component of the site, the sediments being transported by the Agulhas current are trapped by submarine canyons on the continental shelf allowing for remarkably clear waters for the development of coral reefs. The interplay of this environmental heterogeneity is further complicated by major floods and coastal storms, events which are regularly experienced in the GSL. The site is also of sufficient size and retains most of the key elements that are essential for long-term functioning of the ecosystem.

Criterion (iii): Superlative natural phenomena and scenic beauty

The GSL is geographically diverse with superlative scenic vistas along its 220km-long coast. From the clear waters of the Indian Ocean, wide undeveloped sandy beaches, forested dune cordon and mosaic of wetlands, grasslands, forests, lakes and savanna, the park contains exceptional aesthetic qualities. Three natural phenomena are also judged outstanding. One is the shifting salinity states within St. Lucia which are linked to wet and dry climatic cycles. The lake responds accordingly with shifts from low to hyper-saline states. A second natural phenomena of note is the spectacle of large numbers of nesting turtles on the beaches of GSL and the migration of whales, dolphins and whale-sharks off-shore. Finally, the huge numbers of waterfowl and large breeding colonies of pelicans, storks, herons and terns are impressive and add life to the wild natural landscape of the area.

Criterion (iv): Biodiversity and threatened species

The five ecosystems found in the GSL provide habitat for a significant diversity of African biota. The species lists for the GSL are the most lengthy in the region and population sizes for most of them are viable. There are also 48 species present that are listed as threatened internationally and 147 on the CITES list. The GSL is clearly a critical habitat for a range of species from Africa's marine, wetland and savanna environments.

The nomination does not make a convincing case for its inscription under criterion (i) – Earth's History and Geological Features. Certainly there are abundant invertebrate fossils found in the marine sedimentary deposits but this is by no means a rarity. The heterogeneous landforms are bound up more with the ecological processes which are the dominating natural features of the site.

7. RECOMMENDATION

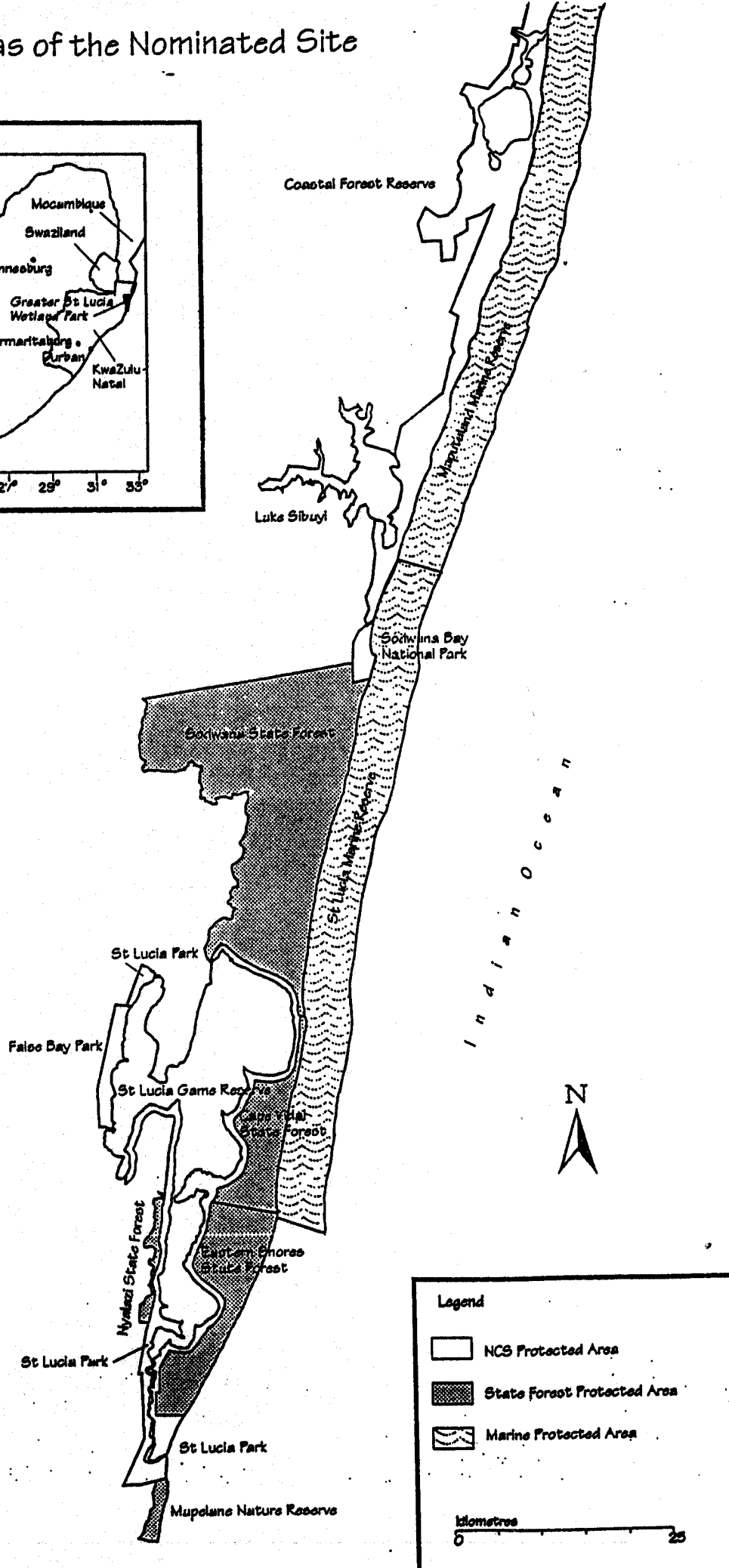
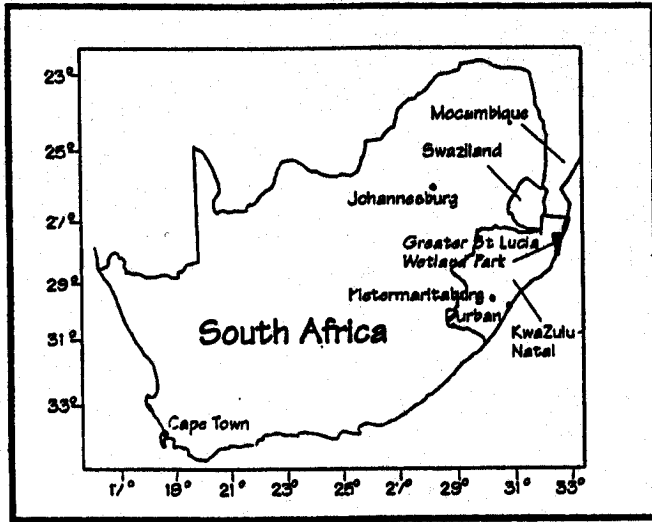
At its twenty-third ordinary session, the Bureau recommended to the Committee that the Greater St. Lucia Wetland Park be **inscribed** on the World Heritage list under natural criteria (ii), (iii) and (iv). The Centre has commended the Government of South Africa on 3 issues:

- ◆ for the democratic process it went through that led to the Cabinet decision to ban sand mining in the area and to subsequently nominate the area for World Heritage;

- ◆ the long history of conservation in the area and the very professional work of the Kwazulu-Natal Nature Conservation Service in maintaining the site;
- ◆ the launch of the Lubombo Spatial Development Initiative which the neighbouring countries of Swaziland and Mozambique which provides the regional conservation and development framework for the GSL and which will further strengthen community conservation work in the area.

The Committee should also make note of the possible extensions of the GSL including a possible future transfrontier site with Mozambique. It should also urge the completion of the land claim negotiations and confirm that World Heritage site designation should not prejudice this process.

Component Areas of the Nominated Site



Map 1. Location of Nominated Site

CANDIDATURE AU PATRIMOINE MONDIAL - ÉVALUATION TECHNIQUE UICN

LE PARC DE LA ZONE HUMIDE DE SAINTE-LUCIE (AFRIQUE DU SUD)

1. DOCUMENTATION

- i) **Fiche technique UICN/WCMC**
- ii) **Littérature consultée:** Lubombo Spatial Development Initiative. n.d. 44p.; Bird, E.C. 1968. **Coasts**. MIT Press; Heydorn A.E.F. 1989. The Conservation Status of Southern African Estuaries, *in* Huntley, B.J. **Biotic Diversity in Southern Africa**. O.U.P.; Hockey P. and C.D. Buxton. 1989. Conserving Biotic Diversity on Southern Africa's Coastline *in*. *ibid*; Hughes, R.H. and J.S. Hughes. 1992. **A Directory of African Wetlands**. IUCN/UNEP/WCMC; Begg, G. 1978. **The Estuaries of Natal**. Town and Country Planning Commission. Natal. 657p.; Sheppard C. and S. Wells. 1988. **Coral Reefs of the World**. Vol.2. IUCN/UNEP; MacKinnon, J. & K. 1986. **Review of the P.A. System in the Afrotropical Realm**. IUCN/UNEP; Stuart S. et al. 1990. **Biodiversity in Sub-saharan Africa**. IUCN. 242p.; Ramsar Convention. 1992. St. Lucia System. Monitoring Procedure Report 28; Ramsar Bureau. Various dates. Information Sheets on Ramsar Wetlands in South Africa; Davis S. ed. **Centres of Plant Diversity**. Vol1. IUCN/WWF; Taylor, R.H. 1993. Proceedings of the Workshop on Water Requirements for St. Lucia. Dept. Environmental Affairs, 83p.; Kyle, R. 1999. Factsheet on Resource Utilisation in Kosi Bay. KZDNC. 12p.
- iii) **Consultations:** Représentants de l'Agence fédérale des parcs et de l'Agence provinciale des parcs.
- iv) **Visite du site:** janvier 1999. Jim Thorsell.

2. RÉSUMÉ DES CARACTÉRISTIQUES NATURELLES

Le Parc de la zone humide de Sainte-Lucie (PSL) est situé sur la côte nord-est de la province du Kwazulu-Natal, en Afrique du Sud. Il s'étend sur environ 220 km vers le sud, entre la frontière mozambicaine et le cap Sainte-Lucie. La largeur de la portion terrestre du littoral varie entre 1 et 24 km. Une réserve marine de 5 km de large s'étend sur 155 km le long de la côte. Le site candidat comporte 13 unités de conservation, distinctes mais contiguës, couvrant une superficie totale de 239 566 ha. La région a un climat subtropical influencé par le courant océanique Agulhas sur le littoral. Plusieurs cours d'eau dont le bassin versant se trouve à l'extérieur, dans les monts Lubombo, pénètrent dans le parc. La riche source de fossiles marins que l'on trouve dans les sédiments du Crétacé supérieur illustre la relation gondwanienne du site. Ce dernier comporte les cinq écosystèmes suivants:

- ♦ l'écosystème marin, caractérisé par une mer chaude, la limite méridionale des récifs coralliens d'Afrique, des canyons sous-marins et de longues plages de sable;

- ◆ le système dunaire côtier, comprenant des dunes linéaires atteignant 183 m de hauteur, des forêts subtropicales, des plaines herbeuses et des zones humides;
- ◆ des systèmes lacustres comportant 2 lacs reliés à un estuaire (Sainte-Lucie et Kosi) et 4 grands lacs d'eau douce;
- ◆ les marais de Mkuze et Mfolozi, avec une forêt marécageuse, des roselières étendues et des zones humides à papyrus;
- ◆ les rivages occidentaux intérieurs, avec des terrasses littorales anciennes et une savane boisée.

Outre la variété que chacun de ces écosystèmes confère au site candidat, les nombreuses relations qui existent entre eux présentent un intérêt majeur pour la recherche sur les processus géomorphologiques et biologiques en cours. Le site englobe quatre sites Ramsar.

Cette hétérogénéité environnementale importante est associée à une diversité remarquable du biote naturel. Ce facteur est renforcé par l'emplacement du site, dans une zone de transition entre le biote africain tropical et le biote africain subtropical, à l'intérieur du centre d'endémisme du Maputuland. La flore du PSL est diverse, avec 734 genres et 44 espèces endémiques enregistrés, dans une mosaïque de végétation de forêt/prairie/zone humide et marine. L'élément marin est riche en espèces avec 53 espèces coralliennes, 812 mollusques et 991 poissons de récifs. Le PSL abrite 50 espèces d'amphibiens, 109 espèces de reptiles, dont plusieurs sont endémiques ou menacées. C'est également le principal lieu de ponte du caret et de la tortue luth en Afrique australe. L'avifaune est particulièrement diversifiée avec 521 espèces et le parc est une aire de nidification et un refuge important pour les oiseaux d'eau et les limicoles migrateurs. Le PSL est également connu pour ses 97 espèces de mammifères terrestres et ses 32 espèces de mammifères marins, y compris des delphinidés et des cétacés. Quant aux espèces menacées (inscrites aux annexes de la Convention de la CITES), elles sont au nombre de 147.

3. COMPARAISON AVEC D'AUTRES AIRES PROTÉGÉES

La Liste du patrimoine mondial compte actuellement 42 sites importants pour leurs zones humides et 40 autres présentant un intérêt secondaire à cet égard. Quarante biens naturels du patrimoine mondial possèdent un élément côtier et marin. En Afrique, le seul bien du patrimoine mondial comparable au PSL est le Banc d'Arguin, en Mauritanie, qui possède des eaux marines et estuariennes sableuses mais n'a ni habitat d'eau douce ni récif corallien. Il en va de même du Sanctuaire de l'Oryx d'Arabie, à Oman, ainsi que du site de la baie Shark en Australie, d'El Vizcaino au Mexique et, dans une moindre mesure, de Donaña en Espagne. Aucun de ces sites ne possède la même association d'espèces terrestres que le Parc de la zone humide de Sainte-Lucie où l'on trouve, entre autres, des grands herbivores comme le rhinocéros et l'hippopotame et des prédateurs comme le léopard. Le PSL présente quelque ressemblance avec le Bien du patrimoine mondial de l'île Fraser, en Australie, qui possède des dunes de sable côtières importantes, ainsi que des espèces marines très diverses, notamment des tortues, des dauphins, des cétacés, des poissons et des invertébrés marins en abondance. Toutefois, le PSL se distingue des autres sur le plan terrestre par sa vaste gamme de zones humides salines et d'eau douce, d'estuaires, de plaines d'inondation et de savanes.

Situé en Afrique australe, le système de Sainte-Lucie s'étend à l'intérieur du Mozambique, jusqu'à la péninsule d'Inhaca, avec des marais, des lacs d'eau douce et des lagunes côtières. (Le dossier de la candidature précise que, du fait de sa nature transfrontalière, une extension du site est actuellement en discussion avec les autorités mozambicaines.) On trouve d'autres lagunes et estuaires d'eau douce plus au nord, sur la côte mozambicaine (par exemple Inharrime R.) mais leurs caractéristiques naturelles sont moins variées que celles du PSL et ne sont pas suffisamment protégées. Il existe d'autres zones humides côtières importantes dans la région, la baie de Walvis, le cap Cross et Sandwich Harbour en Namibie mais il s'agit de systèmes arides dont la gamme des écosystèmes et le biote sont moins larges que ceux du Parc de la zone humide de Sainte-Lucie.

À l'intérieur de la Province biogéographique sud-africaine de zones boisées et de savanes se trouvent 389 aires protégées, souvent très étendues, telles que Kruger, Hwange et le complexe de l'Okavango. Tous ces sites sont continentaux et ne présentent pas les éléments côtiers importants du PSL.

Enfin, le long de la côte sud-africaine, on compte une cinquantaine d'aires de conservation côtière (voir carte), dont l'une (Parc national de la péninsule du Cap) pourrait faire l'objet d'une candidature au patrimoine mondial. Toutefois, le PSL se distingue nettement de tous ces sites du fait qu'il abrite le système estuarien le plus vaste d'Afrique et qu'il est la seule région à posséder des récifs coralliens aussi divers et un nombre d'espèces menacées aussi important.

Répartition des aires de conservation côtières entre le fleuve Orange et la baie de Kosi.

(Le nom des réserves, leur étendue et leur statut de conservation sont précisés dans le tableau 1 de Hockey et Buxton, 1989.)

4. INTÉGRITÉ

Le site est géré à des fins de conservation depuis 1895, année où le gouvernement du Zululand créa les premières réserves. La plus grave menace que le PSL ait connue fut un projet d'exploitation du sable, annulé par le Gouvernement sud-africain en 1996. À l'issue de débats publics prolongés, il fut décidé d'interdire l'ouverture de mines de titane à l'intérieur du site et de proposer la candidature de ce site au patrimoine mondial. Les problèmes énumérés ci-après, liés à l'intégrité du site, demeurent néanmoins.

4.1. Protection du bassin versant et développement régional

Tous les estuaires se caractérisent par un équilibre dynamique et une interaction constante entre l'homme et la mer. Comme on l'a vu pour d'autres zones humides du patrimoine mondial, les changements induits par l'homme en amont dans le bassin versant peuvent avoir des effets considérables. Le détournement des eaux en amont, les pratiques agricoles et la construction d'une route ont eu des effets défavorables sur le PSL. Ces questions ont été traitées en 1992, lors d'un atelier sur les besoins en eau du lac Sainte-Lucie, et demeureront un sujet de préoccupation tant que la mise en valeur du bassin hydrographique se poursuivra.

Reconnaissant les liens économiques, sociaux et écologiques existant dans toute la région où se trouve le PSL, les gouvernements d'Afrique du Sud, du Mozambique et du Swaziland ont lancé l'initiative de mise en valeur de l'espace de Lubombo (Lubombo Spatial Development Initiative-LSDI). Cet exercice de planification régionale trilatérale offrira un mécanisme supplémentaire pour résoudre les problèmes existant dans le bassin hydrographique du Parc de la zone humide de Sainte-Lucie. La candidature du site est donc envisagée dans un contexte élargi de développement intégré; en outre, un plan régional et un cadre de gestion de l'environnement sont actuellement en préparation.

4.2. Structure de gestion

Reconnaissant la nécessité d'intégrer le Parc de la zone humide de Sainte-Lucie dans l'initiative LSDI, ainsi que la difficulté que représente la gestion des 13 éléments constitutifs du PSL, les gouvernements national et provincial ont décidé d'établir une autorité responsable de la région du Parc de la zone humide de Sainte-Lucie. Cette autorité rassemblera les unités de conservation sous une seule désignation juridique. Il convient de souligner qu'elle confiera la gestion du site au Service de conservation de la nature du Kwazulu-Natal, reconnu par l'UICN comme l'un des organes de gestion des aires protégées les plus efficaces du monde.

4.3. Revendications foncières

La plupart des terres du Parc de la zone humide de Sainte-Lucie font l'objet de négociations menées dans le cadre de la Commission de restitution des droits fonciers. Les résultats de ces négociations, qui devraient être annoncés prochainement, seront vraisemblablement compatibles avec la protection du statut de conservation de la région mais pourraient entraîner une modification des limites des zones périphérique et tampon. Le Bureau notera que sa décision concernant la candidature ne devrait pas porter préjudice au processus de négociation en cours.

4.4. Prélèvement de ressources et questions liées aux communautés locales

Certaines parties du PSL sont gérées de façon à permettre des prélèvements contrôlés de certaines ressources naturelles (cf. Catégorie IV UICN des aires protégées) qui, étant difficiles à obtenir à l'extérieur du parc, représentent une source de revenu et de subsistance importante pour les populations vivant dans le voisinage du parc. Par exemple, la pêche commerciale dans le lac Sainte-Lucie s'élève annuellement à quelque 14 000 tonnes de poissons. Le système du lac Kosi fait l'objet d'une utilisation encore plus intensive et des rapports de surveillance continue de 1997 indiquent que l'on y prélève une large gamme de produits. En moyenne, 488 personnes utilisent chaque jour le site et y récoltent des produits représentant 1,6 million de Rand par année. Une surveillance étroite suggère que l'essentiel de cette utilisation est légale et durable et principalement destinée à la subsistance. Parmi les autres produits prélevés figurent l'herbe ncema et les roseaux. Chaque année en juin, environ 1,500 personnes sont autorisées à récolter ces produits chaque jour durant une période de 2 semaines. D'autres permis alloués aux membres de groupes tribaux locaux autorisent également le prélèvement d'invertébrés marins et de chaume. Le ramassage des œufs de crocodiles sauvages est réglementé.

Toutes les activités susmentionnées sont soumises à des normes de gestion, de recherche et de surveillance continue intensives. Elles sont limitées à un tiers environ de la superficie totale du site. Dans les deux tiers restants, toute activité extractive est interdite. Avec environ 100 000 personnes appartenant à 48 groupes tribaux dans le voisinage du PSL, les programmes de conservation communautaires en place sont essentiels pour limiter le plus possible les conflits et porter les avantages au maximum. À cet égard on notera que des fonds ont été alloués par le WWF pour appuyer les efforts communautaires de conservation. Toutefois, la province doit garantir un soutien suffisant à la gestion du Parc de la zone humide de Sainte-Lucie en lui attribuant un budget suffisant.

4.5. Restauration des habitats dégradés

Comme la plupart des aires protégées, le Parc de la zone humide de Sainte-Lucie connaît certains problèmes liés aux espèces exotiques, y compris les plantations forestières. Un train de mesures a été adopté pour résoudre ce problème mais, là aussi, un soutien permanent du gouvernement s'impose. Autre dépense de gestion courante: une intervention active visant à draguer l'estuaire de Sainte-Lucie.

4.6. Modification des limites

Comme l'indique le dossier de candidature, la constitution d'un site transfrontière fait actuellement l'objet de négociations avec le pays voisin, le Mozambique. On étudie aussi la possibilité d'agrandir la réserve marine pour l'aligner avec la composante terrestre sur toute la longueur du PSL. Ces deux initiatives sont louables et ne pourront qu'être bénéfiques à la conservation du site. Selon les résultats des négociations sur les revendications foncières, des ajouts pourraient également être envisagés à l'avenir. Le Bureau prendra note de ces extensions éventuelles.

5. AUTRES COMMENTAIRES

Aucun.

6. CHAMP D'APPLICATION DES CRITÈRES NATURELS DU PATRIMOINE MONDIAL

La candidature du Parc de la zone humide de Sainte-Lucie fait état des quatre critères naturels du patrimoine mondial. L'UICN estime que l'inscription est justifiée sur la base des trois critères suivants:

Critère (ii): processus écologiques

La conjugaison des processus fluviaux, marins et éoliens qui ont commencé au début du Pléistocène et se poursuivent aujourd'hui encore à l'intérieur du PSL, a créé un relief très varié. L'emplacement géographique du parc, dans une zone de transition entre l'Afrique subtropicale et l'Afrique tropicale, ainsi que sa situation côtière expliquent sa diversité spécifique exceptionnelle. Les phénomènes de spéciation qui ont eu lieu par le passé dans le centre d'endémisme du Maputland et qui se poursuivent, contribuent à la diversité et à l'interaction entre les processus évolutionnaires à l'œuvre dans le site. Dans la partie marine du site, les sédiments transportés par le courant Agulhas se déposent dans les canyons sous-marins du plateau continental, ce qui explique la limpidité exceptionnelle de l'eau, propice au développement des récifs coralliens. Cette hétérogénéité environnementale est encore compliquée par des crues importantes et des tempêtes côtières, phénomènes fréquents dans le PSL. Le Parc de la zone humide de Sainte-Lucie est suffisamment vaste et présente la plupart des éléments clés qui sont essentiels au fonctionnement à long terme de l'écosystème.

Critère (iii): phénomènes naturels exceptionnels, beauté naturelle exceptionnelle

Le PSL est géographiquement très varié, avec des panoramas exceptionnels le long d'un littoral qui s'étire sur 220 km. Eaux claires de l'océan Indien, immenses plages de sable largement inexploitées, cordon dunaire boisé et mosaïque de zones humides, prairies, forêts, lacs et savanes – le Parc de la zone humide de Sainte-Lucie possède réellement des qualités esthétiques exceptionnelles. Trois phénomènes naturels sont également considérés comme exceptionnels. Le premier est la salinité variable enregistrée à l'intérieur du site, liée aux cycles climatiques sec et humide: le lac réagit en conséquence, et son profil de salinité oscille ainsi entre faiblement salin et hypersalin. Le deuxième est le spectacle des nombreuses tortues venant pondre sur les plages et la migration des baleines, des dauphins et des requins-baleines au large. Le troisième, enfin, est le nombre impressionnant d'oiseaux d'eau et les importantes colonies reproductrices de pélicans, de cigognes, de hérons et de sternes qui contribuent à animer le paysage sauvage du site.

Critère (iv): diversité biologique et espèces menacées

Les cinq écosystèmes que compte le Parc de la zone humide de Sainte-Lucie abritent une grande diversité d'espèces africaines. La liste des espèces du PSL est la plus longue de la région et les effectifs de la plupart de ces espèces sont viables. À cela s'ajoutent 48 espèces considérées comme menacées sur le plan international et 147 inscrites aux annexes de la CITES. Le site candidat est un habitat d'importance critique pour une multitude d'espèces des milieux marins, dépendant des zones humides et de savane de l'Afrique.

Le dossier de la candidature ne présente pas des arguments suffisamment convaincants en faveur de l'inscription au titre du critère (i) - histoire de la terre et processus géologiques. On trouve certainement un grand nombre de fossiles d'invertébrés dans les dépôts sédimentaires

marins, mais il n'y a rien de rare à cela. L'hétérogénéité du relief est surtout liée aux processus écologiques qui constituent la caractéristique naturelle dominante du site.

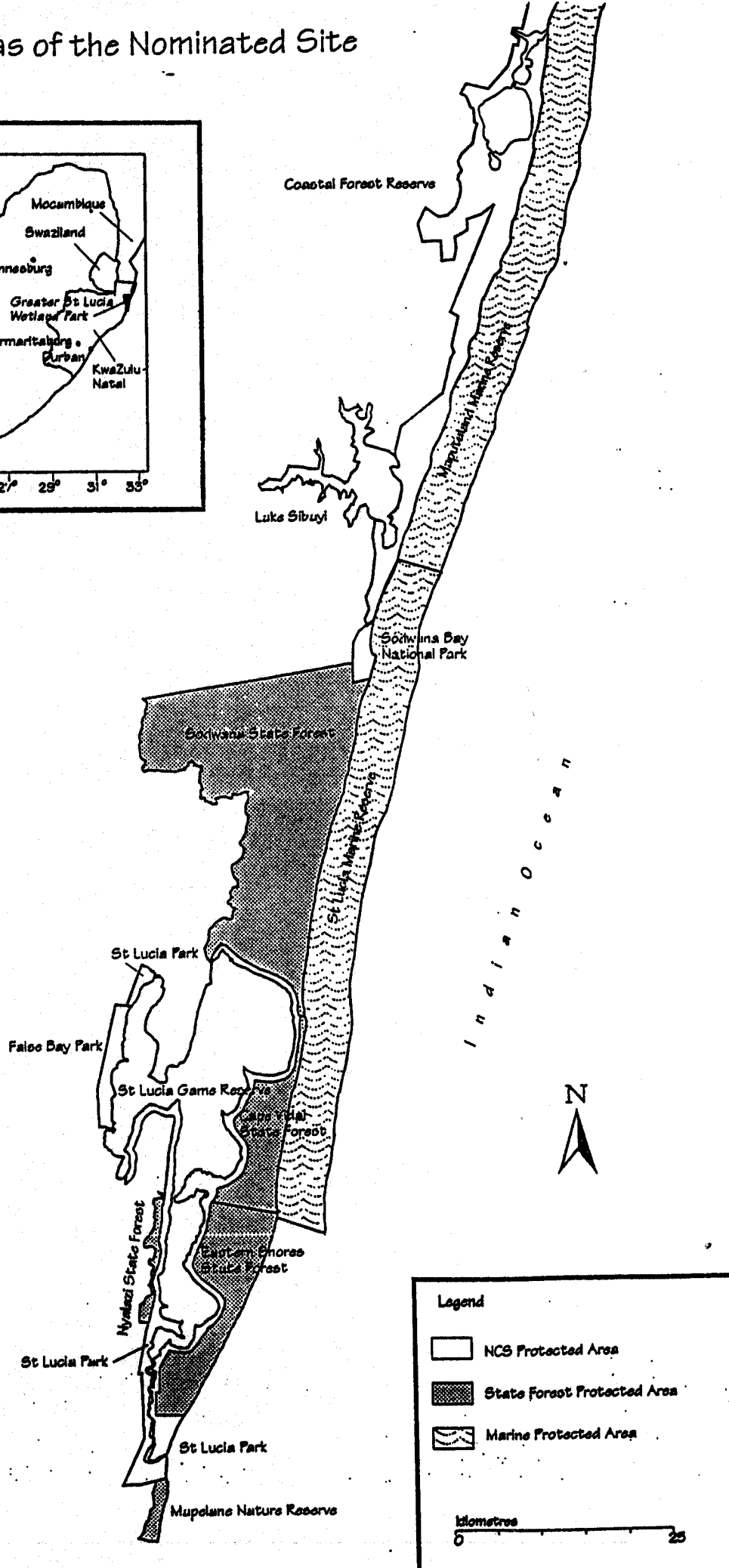
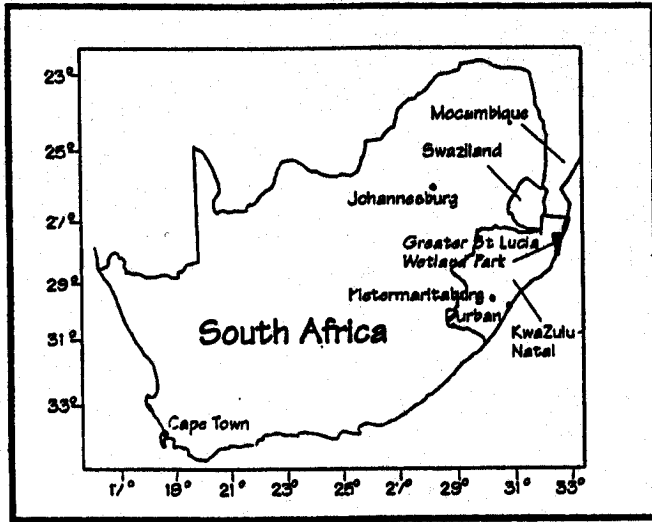
7. RECOMMANDATION

À sa vingt-troisième session ordinaire, le Bureau a recommandé que le Comité **inscrive** le Parc de la zone humide de Sainte-Lucie sur la Liste du patrimoine mondial au titre des critères naturels (ii), (iii) et (iv). Le Bureau a félicité le Gouvernement sud-africain pour les trois motifs suivants:

- ◆ le processus démocratique qu'il a entamé et qui a abouti à la décision du Conseil des ministres d'interdire l'exploitation du sable dans la région, puis de présenter la candidature du PSL au patrimoine mondial;
- ◆ la longue histoire de conservation de cette région et le travail très professionnel du Service de conservation de la nature du Kwazulu-Natal qui assure l'entretien du site;
- ◆ l'initiative de mise en valeur de l'espace de Lubombo (LSDI) avec les pays voisins, le Swaziland et le Mozambique, qui constitue le cadre régional de conservation et de mise en valeur du Parc de la zone humide de Sainte-Lucie et contribuera à y renforcer les efforts communautaires de conservation.

Le Comité devrait également prendre acte des extensions envisagées pour le site candidat, y compris la création d'un site transfrontière avec le Mozambique. En outre, il devrait demander instamment que les négociations relatives aux revendications foncières soient menées à bien et confirmer que l'inscription du PSL sur la Liste du patrimoine mondial ne portera pas préjudice à ce processus.

Component Areas of the Nominated Site



Map 1. Location of Nominated Site