



The Rock Islands Southern Lagoon

as nominated by
The Republic of Palau

for
Inscription on the World Heritage List
February 2012



*This dossier is dedicated to
Senator Adalbert Eledui*



Koror State Government

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Office of the Governor

September 24, 2010

Mr. Jung, Young Hun
The World Heritage Centre
United Nations Educational, Scientific and Cultural Organization
7, place de Fontenoy
75352 Paris 07 SP, France

Honorable Masaki Emesiochel
Minister of Education and
Chairman, Palau National Commission for UNESCO

Dear Mr. Jung and Chairman Emesiochel,

It is with great honor that the State of Koror recommends that the Rock Islands Southern Lagoon be nominated as a United Nations Educational, Scientific, and Cultural Organization (UNESCO) World Heritage site. The nomination of this site is one of the goals of the leadership of Koror State and especially my administration.

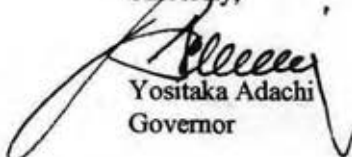
The well-known biodiversity of the Republic of Palau lies in the marine and terrestrial environment of the Rock Islands, where important habitats for threatened and endangered species are situated. The significant aesthetic and cultural values of the landscape of the Southern Lagoon are integral to the identity of the State and our island nation.

The Rock Islands is a place that has seen increasing levels of protection since 1956 for resource preservation and sustainable use. Most recently Koror State passed public law no. K9-220-2010 to extend the time for the Rock Islands Southern Lagoon Management Plan. The management plan was established to have a comprehensive conservation program for the Southern Lagoon. Becoming a world heritage site will help us better adapt management to address complex challenges and issues that are constantly changing.

Koror State recognizes the significance of the Rock Islands Southern Lagoon as a mixed natural and cultural site. Our nomination onto UNESCO World Heritage List, is part of our continued efforts towards achieving long-term sustainable management and effective conservation of this important area.

Koror State Government fully supports the nomination of the Rock Islands Southern Lagoon to the UNESCO World Heritage list and will work to fully ensure the nomination is successful in the approval process.

Sincerely,



Yositaka Adachi
Governor

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Executive Summary

State Party

Republic of Palau

State

Koror State

Name of Property

Rock Islands Southern Lagoon (RISL)

Geographical coordinates to the nearest second

Geographic Center: 134°20'34.48"E, 7°14'48.93"N.

Textual description of the boundary of the nominated property

The RISL consists of a 1,002 square kilometer area and includes 445 limestone islands and 52 marine

lakes surrounded by a lagoon with fringing reefs, patch reefs, and shallow water marine areas. The buffer zone includes all other territorial waters of the state of Koror, minus those in the excluded urban area, and covers a total area of 1,640 square kilometers.

A4 (or "letter") size map of the nominated property, showing boundaries and buffer zone

See **Figure i**, next page.

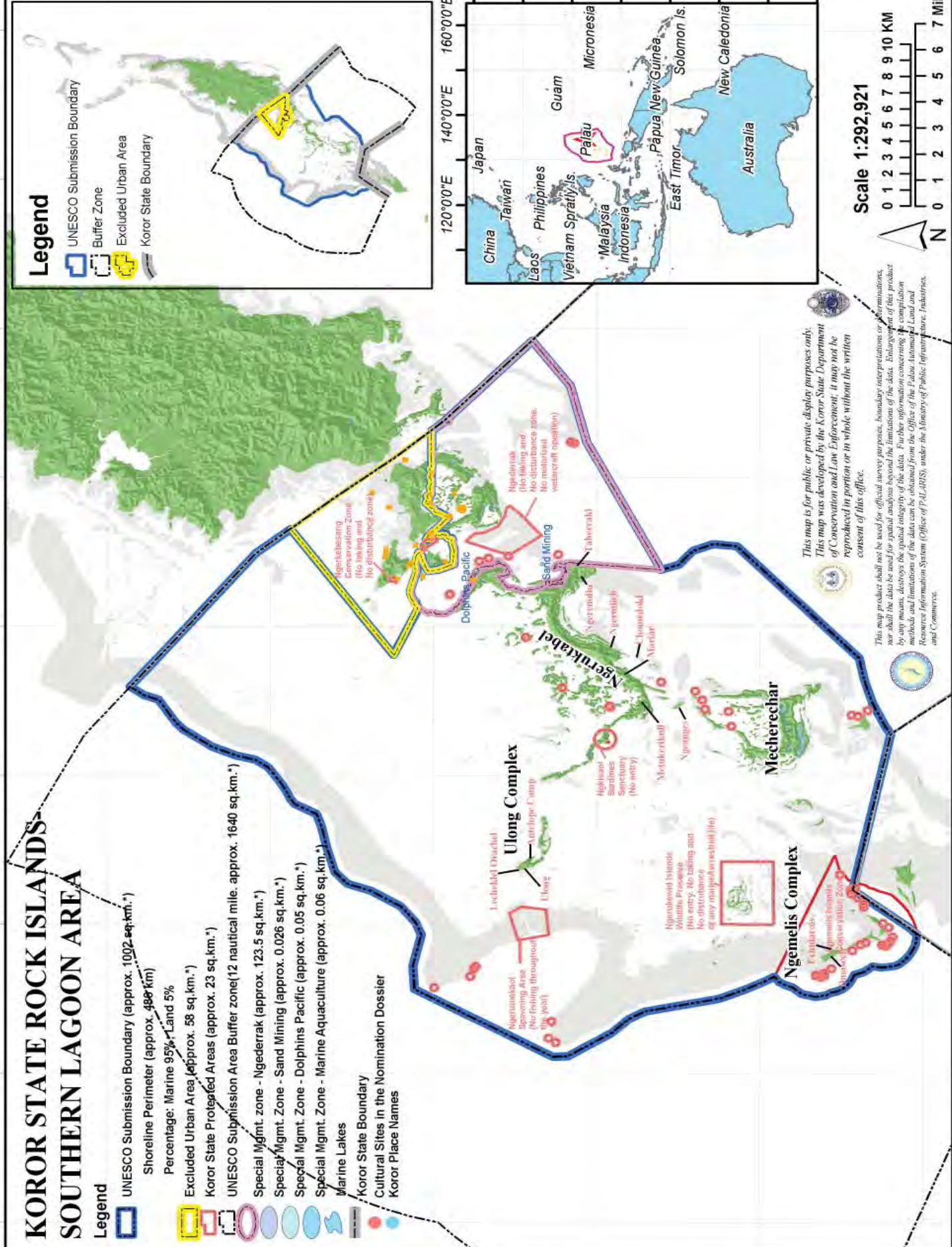
Justification /Statement of Outstanding Universal Value

The RISL has superlative natural and cultural features. The RISL is an outstanding example of human interaction with a precarious environment.



Ngerukewid Islands National Wildlife Preserve. Photo by Patrick Colin.

134°50'E 134°45'E 134°40'E 134°35'E 134°30'E 134°25'E 134°20'E 134°15'E 134°10'E 134°5'E



KOROR STATE ROCK ISLANDS SOUTHERN LAGOON AREA

- Legend**
- UNESCO Submission Boundary
 - Buffer Zone
 - Excluded Urban Area
 - Koror State Boundary



- Legend**
- UNESCO Submission Boundary (approx. 1002 sq.km.*)
 - Shoreline Perimeter (approx. 480 Km)
 - Percentage: Marine 95% Land 5%
 - Excluded Urban Area (approx. 58 sq.km.*)
 - Koror State Protected Areas (approx. 23 sq.km.*)
 - UNESCO Submission Area Buffer zone(12 nautical mile, approx. 1640 sq.km.)*
 - Special Mgmt. zone - Ngederrak (approx. 123.5 sq.km.)*
 - Special Mgmt. Zone - Sand Mining (approx. 0.026 sq.km.)*
 - Special Mgmt. Zone - Dolphins Pacific (approx. 0.05 sq.km.)*
 - Special Mgmt. Zone - Marine Aquaculture (approx. 0.06 sq.km.)*
 - Marine Lakes
 - Koror State Boundary
 - Cultural Sites in the Nomination Dossier
 - Koror Place Names



This map is for public or private display purposes only. This map was developed by the Koror State Department of Conservation and Law Enforcement. It may not be reproduced in part or in whole without the written consent of this office.

The map producer shall not be used for official survey purposes, boundary interpretations or determinations nor shall the data be used for spatial analysis beyond the limitations of the data. The integrity of this product by any means, destroys the spatial integrity of the data. Further information concerning compilation methods and limitations of the data can be obtained from the Office of the Palau, National Land and Resource Information System (Office of PAL-RNIS), under the Ministry of Public Infrastructure, Fisheries, and Commerce.

The abandonment of Rock Island villages in the 2nd millennium AD is an exceptional illustration of the intersection and consequences of climate change, population growth, and subsistence behavior on a society living in a marginal environment. The Rock Islands are highly susceptible to climatic change based upon evidence from the transition of the ‘Medieval Warm Period’ to the ‘Little Ice Age’ in the first and second millennium AD. Human impact on reef resources and reduced production of resources during the ‘Little Ice Age’ resulted in abandonment of villages at AD 1650-1750 and migration to nearby bigger islands with more resources.

The RISL bears exceptional testimony to a living cultural tradition. Contemporary Palauans originated from ancestral Rock Island settlements and identify with the aesthetic and cultural values of the RISL. Cave burials and rock art indicate past cultural behavior.

The RISL is one of the most diverse, complex, and breathtakingly beautiful places on earth. Its lagoon is filled with hundreds of gem like “Rock Islands.” These limestone islands habitats are diverse and include marine lakes, caves, arches, tunnels, coves, forests, and wetlands, each with unique species. White beaches, mangroves, and fringing reefs surround the islands and patch reefs create an oasis for marine life. The RISL is protected by an expansive barrier reef with deep channels and passes with added richness in biodiversity. The habitat complexity is a refuge for a highly diverse assemblage of organisms.

The RISL’s biological and marine habitat diversity ranks as one of the top in the world compared to similarly sized areas.

No other place on earth has this number and variety of marine lakes within a similarly sized area. Five new subspecies of *Mastigias papua*

jellyfish described from these lakes suggests that populations of other species will be recognized as endemics with long evolutionary histories delimited within individual lakes.

The RISL’s resilient reefs make it a critical area for the protection of biodiversity. With minimal human impact, the RISL serves as a natural laboratory for scientific understanding of coral reef recovery from a major warming event caused by climate change. All the endangered megafauna of Palau, 746 species of fish, over 385 species of corals, at least 13 species of sharks and manta rays, 7 species of giant clams, and the endemic nautilus are found in the RISL. The limestone forests and mangroves include all of Palau’s endemic birds, mammals, herpetofauna and nearly half of Palau’s endemic plants including the critically endangered *Ponapea palauensis*.

The RISL is one of the best managed areas in the world. Thousands of years of customary law combined with current National and State Laws have resulted in effective conservation and protection. The Koror State RISL Management Plan was developed by the Koror community under the guidance of its elected and traditional leaders. Koror State fully supports the establishment of the RISL as World Heritage Site and is committed to keeping the RISL as one of the one of the greatest places on earth.

Criteria under which property is nominated

iii, v, vii, ix, x

Name and contact information of official local agency

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1. Identification of the Property

1. Identification of the Property

Country

Republic of Palau

State

The Rock Islands Southern Lagoon is wholly within the lands and waters of Koror State.

Name of Property

“Rock Islands Southern Lagoon”.

This document refers to the Rock Islands Southern Lagoon as “the Rock Islands”, “RISL”, or “the Property”.

Geographical Coordinates to the Nearest Second

The approximate geographic center of the RISL is located at 134°20'34.48"E, 7°14'48.93"N.

Maps and Plans Showing the Boundaries of the Nominated Property and Buffer Zones

Topographical Map

Figure 1 shows the RISL property including boundaries, buffer zone, topographical relief, conservation zones, and areas of legal protection.

Location Map Showing the Location of the Property within the State Party

Figure 2 is a map of Palau identifying the RISL and its coordinates.



An aerial view of the Rock Islands. Photo by Ann Kitalong

Other Maps and Buffer Zone Statement

A map showing details of the northeast corner (abutting the excluded urban area), **Figure 3**, is included. **Figure 4** is a Nautical Chart of the RISL, and is the only map currently available showing bathymetry of Koror and Palau.

The buffer zone for the property includes all waters within the jurisdiction of Koror State, out to 12 nautical miles from land to the east and west of the lagoon. Pelagic waters in the buffer zone are regulated by Palauan National Government regulations on fishing, shipping, and other activities. The buffer zone maintains connectivity and interdependence with the pelagic environment.

The southern boundary abuts neighboring Peleliu State. In January 2011 the governors of Koror

and Peleliu States signed a Memorandum of Understanding to jointly manage and protect the German Channel portion of the southern border of the RISL. Parts of the northern boundary adjoin waters surrounding the urban area of Koror, Palau's economic center and former capital. The boundary of the property was selected to maximize the protection of important areas of the lagoon, balanced with local capacity to manage the area and minimize threats and human impact. The Rock Islands Southern Lagoon Management Plan 2004-2008 (currently under revision) covers all waters under Koror State jurisdiction.

Area of Nominated Property (ha.)

The Rock Islands Southern Lagoon is 100,200 hectares. The area of the buffer zone is 164,000 hectares.

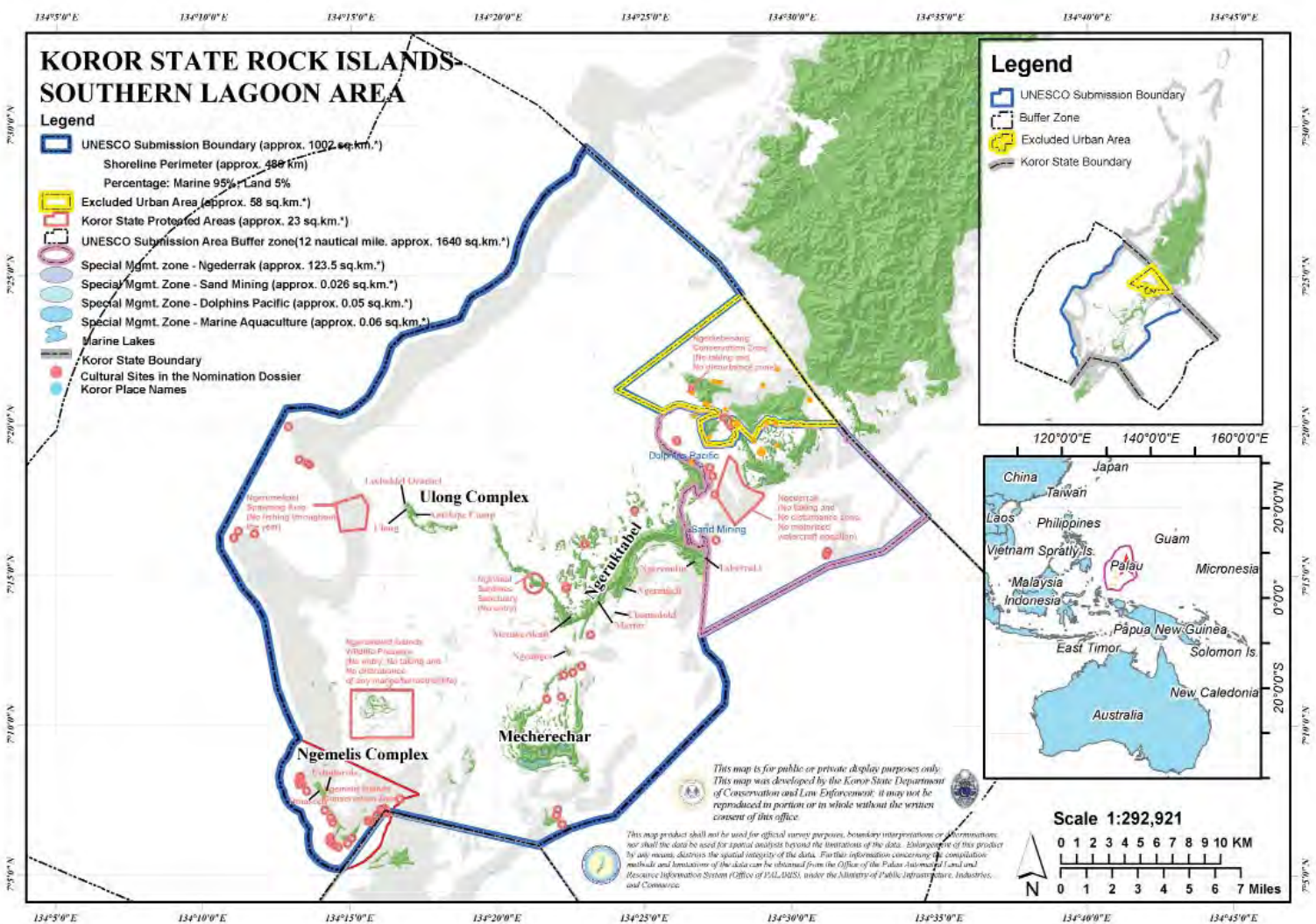


Figure 1. Descriptive map of the RISL.

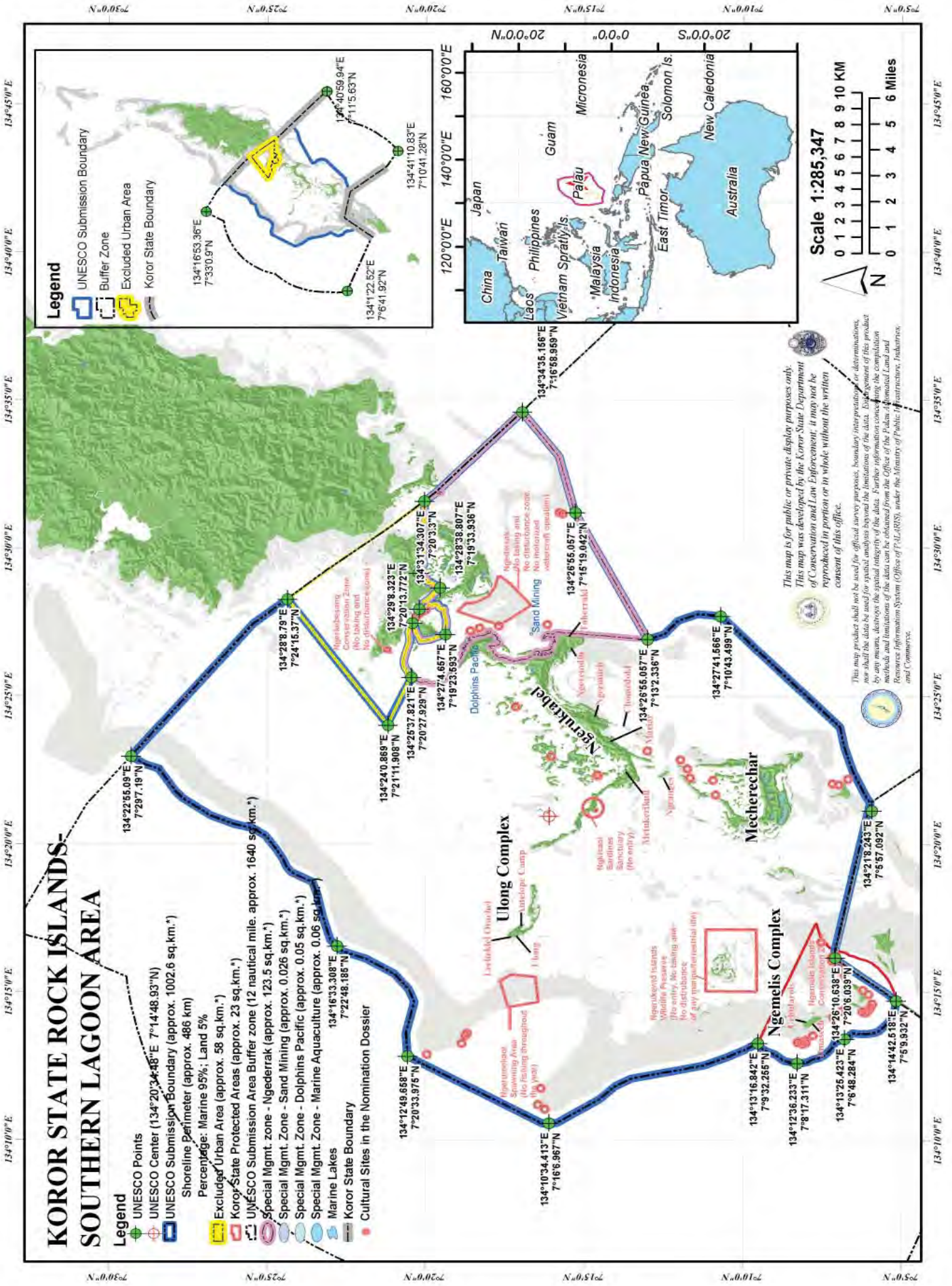


Figure 2. Coordinates of the RISL.

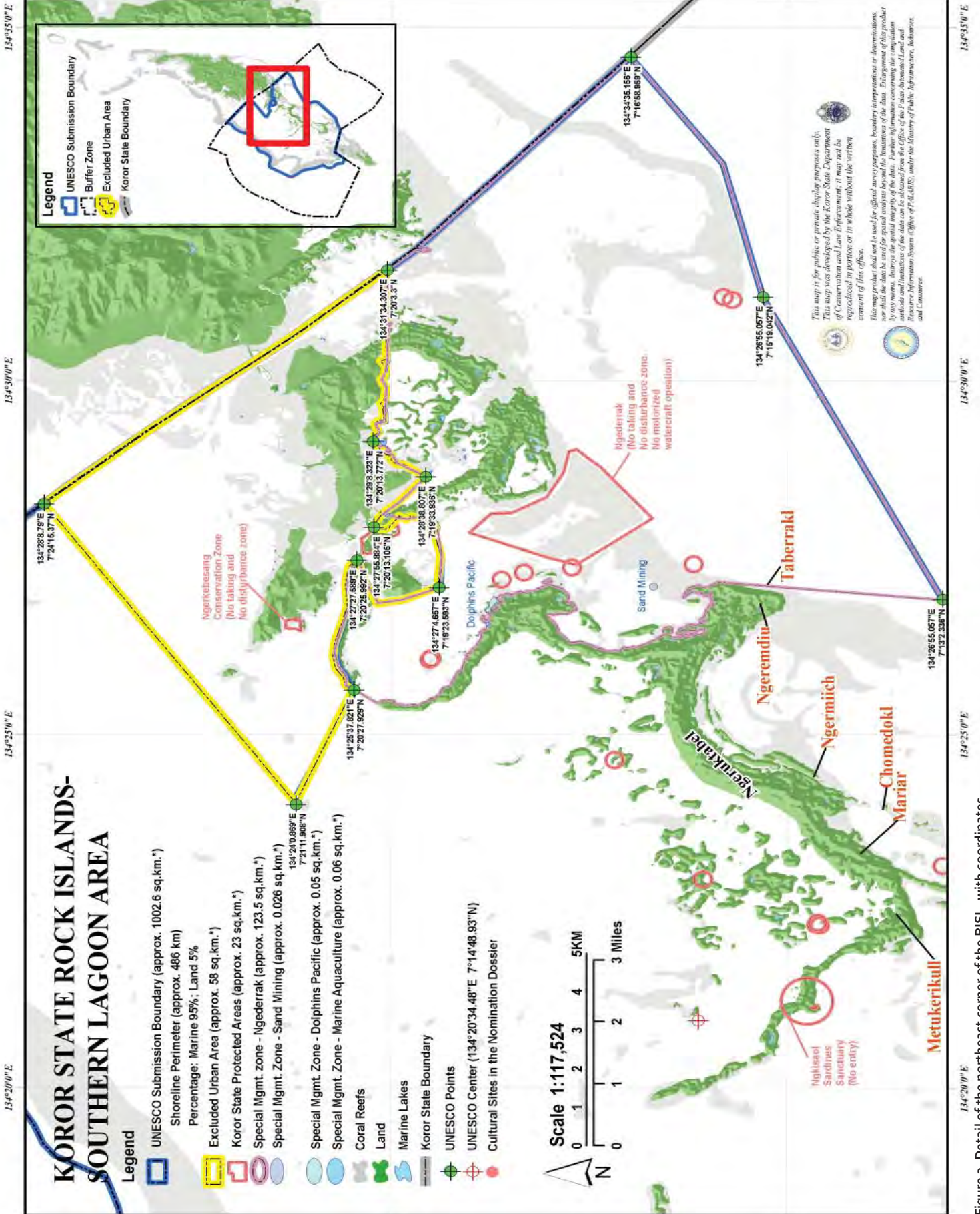


Figure 3. Detail of the northeast corner of the RISL, with coordinates.

2. Description of the Property

2.a1 Description of Natural Heritage

The Rock Islands Southern Lagoon is located in the Pacific island archipelago of the Republic of Palau. The center of the island chain is located near 7 degrees north latitude and 134 degrees east longitude, 850km north of West Papua in Indonesia and 900km east of the island of Mindanao in the southern Philippines. Palau forms the southwestern-most island group of the Caroline Islands of Micronesia. The RISL is located in Koror, one of Palau's 16 states. Approximately 70 percent of Palau's population resides in Koror, the commercial and tourist hub of the nation.

The marine and terrestrial areas of the Rock Islands Southern Lagoon have unparalleled biological, cultural, and economic value to Palau and the world. The RISL provides the foundation for Palau's tourism industry and in turn, the nation's economy. The Property also contributes substantially to the people of Palau's health and well-being through commercial and subsistence harvesting of its natural resources. The RISL is an essential component of Palau's extraordinary biological diversity, and home to critical habitat for the majority of the country's threatened and endangered species. These resources are under increasing pressure as Palau develops.



Islands, reef flats, and marine lakes in the RISL. Photo by Patrick Colin.

In addition to being a source of subsistence and livelihood, the RISL is also a source of national pride and reverence. For millennia, Palauans have used both traditional resource management techniques and, more recently, modern conservation strategies to protect the biodiversity and cultural values of the RISL while living off of its resources. Palauans remain passionate about maintaining these resources and promoting sustainable subsistence and managed tourism within the RISL in order to protect their natural and cultural heritage.

Each Rock Island complex within the nominated Property has unique characteristics. One of the most well known, yet least visited complex is the Ngerukewid Islands Wildlife Preserve. This island group, also known as the “Seventy Islands,” was designated a national preserve in 1956 and its image is widely used in marketing Palau as a tourist destination. The Ulong Complex is noteworthy because in AD 1783, the first long-term contact with the Western world occurred when the crew of the English packet, the *Antelope*, camped here after running aground nearby. Ngeruktabel Complex includes the second largest island in Palau, Ngeruktabel. This Ngeruktabel Complex and the neighboring Mecherchar Complex have a high concentration of marine lakes (Hamner and Hamner 1998). The Kmekumer Group is located near the western barrier reef and known for its sandy bottomed waters while the Babelomekang Group is home to lovely beaches (Colin 2009). It is common to find the endangered endemic palm, *Hydriastele palauensis*, in the Ngerukewid and Kmekumer Complexes. The Ngemelis Island Complex, particularly its southern reef, has many of Palau’s premier dive sites (Colin 2009). Its steep walls, corners, and blue holes provide opportunities for divers to have close encounters with sharks,



turtles, and manta rays. This has made this area a very important tourist attraction.

Geology

Islands within the RISL are carbonate fossil islands formed during the Miocene era. Coral reefs were uplifted to form dry islands, which have eroded over millions of years to form the iconic islands known today as the Rock Islands (Colin 2009).

Geologic diversity

Millions of years of uplifting, erosion, and other processes have yielded an abundance of geological diversity within the RISL, including high- and low-lying limestone “Rock Islands”, coral reefs, marine lakes, and caves. The RISL is enclosed by a vast barrier and fringing reef system that is well developed and continuous on the west side and less developed on the east side. This reef system, enclosing a shallow lagoon with an estimated area of over 120,000ha, contains approximately 683 patch reefs and 11.6km of fringing reefs (Yukihira et al. 2007). Within the Property, there are about 445 karstic islands (Yukihira et al. 2007; PALARIS 2011), the majority of which are rugged and steep islands, although there are a small number of low islands on the barrier reef.

Most of the Rock Islands range from 10-100m above mean sea level (Mason 1955). Many display distinctive mushroom-like shapes due to the presence of sea-level notches, overhangs extending around their perimeters which were believed to have formed from chemical, biological, and physical

Distinct island groups

- Ulong Complex
- Ngeruktabel Complex
- Ngerukewid Islands National Wildlife Preserve
- Ngemelis Island Complex
- Mecherchar Complex
- Kmekumer group
- Babelomekang group



processes (Corwin et al. 1956; Hodgkin 1970; Colin 2009). Over time, rainwater has dissolved the interior of many of the Rock Islands creating features such as fissures, sinkholes, caves, arches, and speleotherms (Fitzpatrick and Kataoka 2005).

Most of Palau's Rock Islands are components of major complexes of different size islands containing marine basins and lakes that have extremely complex and deep marine channels (Colin 2009). Minor Rock Island complexes are smaller and in outlying areas. While these islands are also separated from other complexes by deep lagoons, within them they have shallow bottomed waters.

Habitat Diversity

The Rock Islands Southern Lagoon is among the most biologically diverse marine areas in the world. Its habitats provide temporary or permanent homes for an impressive number of species including several that are threatened or endemic to Palau. The RISL hosts an exceptional number of marine environments within a small area, including barrier reefs, outer reef channels and passes, Rock Island shallow flats, southern lagoon shallow flats, reef basins, lagoon patch reefs, Rock Island notch and fringing reef slopes, Rock Island inner basins and

coves, marine lakes, mangroves, seagrass and algal beds, shallow and deep lagoon sediment bottoms, and the planktonic lagoon environment (Colin 2009). Within many of these, numerous finer scale habitats are found.

Marine Lakes

One of the most defining and unique features of the RISL are the marine lakes. The RISL is home to 52 marine lakes (Koror State is home to 53 marine lakes; the Property includes 52 of these (Colin 2009; L. Colin pers. comm.). Marine lakes are isolated bodies of seawater separated from the ocean by a surrounding land barrier (Dawson and Hamner 2005). They retain connectivity to the ocean through fissures, cracks, and tunnels within the porous pit and pinnacle topography. The RISL's marine lakes vary between 6,000 and 15,000 years old. They formed when rising sea level filled basins, sinkholes, and natural depressions found between the karstic ridges. Many of the Rock Island complexes have marine lakes, with the highest concentration found on Ngeruktabel Island (Colin 2009).

Marine lakes are generally classified as either holomictic or meromictic lakes. Holomictic lakes have a uniform water column, are generally



Mastigias papua etpisoni in Jellyfish Lake. Photo by Michael N. Dawson.

oxygenated to the bottom, and have habitats and biological assemblages similar to that of the lagoon. In contrast, meromictic lakes have stratified layers of water with an oxygenated upper layer and anoxic lower layer that are sometimes separated by a layer of a pink bacteria. The anoxic layer is filled with poisonous levels of hydrogen sulfide (Hamner and Hamner 1998). The upper layer of meromictic lakes supports a community of marine invertebrates and algae, and few vertebrates.

There are physical, biological, and geological features that make each lake remarkable and unique from other lakes and the ocean. The RISL's marine lakes range in depths from as deep as 60m to as shallow as 2-3m. There are lakes that have blue-green waters with reef-like assemblages and visibility to 14m. Other lakes have murky waters with visibility of less than 2m and can be eerily unsettling. Some marine lakes are known for a single dominant marine invertebrate in high abundance that is rarely seen in other lakes or the lagoon. Other lakes have special geological features such as caves full of swiftlets (*Aerodramus pelewensis*) and the Polynesian sheath-tailed bat (*Emballonura semicaudata*) that are only accessible through intertidal tunnels. These dynamic and diverse marine lakes are hardly stagnant waters of banality, rather they are always changing whether

it be through cooler temperatures or a subtly varying biotic assemblage sometimes containing a different dominant sponge every year (Coral Reef Research Foundation (CRRF) unpublished).

The most well known marine lake, and the only one open for tourism, is Ongeim'l Tketau, also known as "Jellyfish Lake". Ongeim'l Tketau, a meromictic lake, is famous for its golden jellyfish (*Mastigias papua etpisoni*) that have varied between 5 and 25 million between 1998 and 2008 (Colin 2009). The golden jellyfish employs an "unusual horizontal and vertical swimming behavior" (Hamner and Hauri 1981). Every day, the golden jellyfish exhibit a unique behavior by migrating with the sun across Ongeim'l Tketau. In their daily migration large masses of jellyfish can accumulate near the edges of the lake under shadows formed by overhanging trees. This unique behavioural pattern, found only in Ongeim'l Tketau, has evolved so the jellyfish avoid the true edges where their natural predators, jellyfish-eating anemones (*Entacmaea medusivora*), are found (Dawson and Hamner 2003).

Other marine lakes of note include Ngermeuangel Lake, Goby Lake, Clear Lake, and Ongael Lake. These lakes are all home to unique subspecies of the golden jellyfish that are genetically, morphologically,

and behaviorally distinct from each other and the golden jellyfish found in the lagoon (Dawson 2005a). In a similar context, and one lake that is still being studied, the cardinal fish (*Sphaeramia orbicularis*) and Rock Island snails (*Nerita savieana*) collected from the lagoon and different marine lakes have evolved over time in their unique habitats.

Coral Reefs

The fringing reefs surrounding the intricate arrangement of Rock Islands, found from secluded inner basins and coves to the reefs lining the Rock Island bays, and along the lengths of some of the larger Rock Islands, create a multitude of habitats (Colin 2009). The inner-most basins may have a long water residence time and relatively few corals, with high sediment and muddy bottoms. However, the still sheltered and more exposed Rock Island fringing reefs are so unusual and spectacular that one site is popularly called Rembrandt's Wall. This habitat supports a distinct set of species. Those Rock Island fringing reefs exposed to seasonal wave action harbor yet another suite of species, similar to those found in more exposed lagoon reefs. All of these reefs have an intertidal sea level notch at their upper reaches and steep slopes extending down to a fine muddy sediment bottom.

These steep reef slopes, in combination with variable shade provided throughout the day by the towering Rock Islands and overhanging trees, provide a unique underwater habitat found in few places in



Coral reef. Courtesy of PCS.

the world. The coral communities are dominated by large foliose or plating colonies and colorful massive faviids. The soft-bodied sponges and sea squirts display a spectacular rainbow of shapes and sizes in abundant quantities, while branching and whip black corals are interspersed along the slopes and walls. Encrusting sponges, often limited to the undersides of rocks or beneath overhangs on typical reefs, are found in extensive vibrant sheets on these often-shaded steep slopes and walls, not unlike what is also found in the marine lakes. In Rock Island channels where tidal flow is extensive, soft corals are added to the mix. It is the unusual species composition and abundance of typically more cryptic species that, in part, makes these reefs so special. Aside from its unique suite of species (CRRF unpublished data), this fringing reef habitat is the home to several newly-described species, including the Latent Slingjaw Wrasse, (*Epibulus brevis*) (Carlson et al. 2008), and several sea squirts (*Stolonica limbata*, *Aplidium controversum*, Monniot and Monniot 1996; and *Rhopaalea circula*, Monniot and Monniot 2001).

Terrestrial Habitats

The mushroom shaped Rock Islands are part of an ancient reef system that after millions of years of geologic and climate change now rest like sleeping giants rising from the sea. These emerald green forested islands provide habitat to a diverse and complex terrestrial ecosystem and contribute to the unique RISL seascape. The Rock Islands are an important habitat for rare birds and animal species. The three main forest types within the Property include the dominate limestone forests, strand forest along back beaches, and mangrove forests adjacent to the marine lakes, coves, and some coastlines.



Terrestrial biodiversity in the RISL includes this endemic Rur, *Bikkia palauensis*, Koror's state flower. Photo by Tarita Holm.



Extensive *Turbinaria reniformis* colonies at Ulong Channel. Photo by Paul Collins.

The Ngemelis Island Complex, Ngerukewid Islands National Wildlife Preserve, and Kmekumer group have sandy beaches that support rare vegetation and nesting sites for endangered species. For example, their beaches have nesting sites for the critically endangered Hawksbill sea turtle, and the beaches and strand habitat support nests of the endangered Micronesian Megapode.

Species Diversity

An important recent terrestrial study shows that island species richness (biodiversity) on islands increases with habitat diversity (Hortal et al. 2009). Similarly, species diversity in the RISL can be expected to be positively related to the wide variety of marine and terrestrial habitats. It follows that the preliminary species data collected thus far in Palau (e.g., Hooper et al. 2002; Fabricius et al. 2007; Ohba et al. 2007; CRRF, unpub.; Palau International Coral Reef Center (PICRC), unpub.; A. Olsen, unpub.) indicate unusually high biodiversity of marine and terrestrial biota for such a small geographic area.

The RISL are home to all of Palau's threatened megafauna (IUCN Classification of CE, EN, VU, or NT; mammals, large reptiles, large fish, birds). All of Palau's endemic birds (Holm et al. 2008; Pratt

and Etpison 2008), mammals (Wiles et al. 1997; Pratt and Etpison 2008), and confirmed endemic herpetofauna (Crombie and Pregill 1999) reside in the Rock Islands. *Nautilus belauensis*, the second largest nautilus in the world, is endemic to Palau (Jereb 2005) and is commonly found in the deeper outer reefs of the RISL. **Appendix A** is a list of known species as of 2004.

Corals

Recent estimates indicate at least 385 species of coral are found in the RISL (Victor 2010). At least 343 species of the more than 400 species (78 genera) of stony corals were found in the RISL during a rapid ecological survey of Palau (Maragos et al. 1994). Based upon specimen collections, Randall (1995) lists 385 species and 66 genera of hard corals. Hence over 75 percent of Palau's hard coral species are found in the RISL. A total of 150 species of soft corals have been observed in Palau (Fabricius et al. 2007), the majority of which are found in the RISL. Ngerumekaol Channel has over 90 species of hard coral with the largest single colony of *Pavona clavus*. This large *P. clavus* colony measured 16m in diameter and 6m in height. Huge colonies of *Turbinaria reniformis* form spectacular whorls along the slopes of the reef in the central floor of the channel (Maragos 1991). In 1998, the

increased sea surface temperatures associated with the El Niño La Niña Southern Oscillation (ENSO) resulted in extensive coral bleaching. In some locations, 100 percent of the coral colonies bleached; across Palau an average of 48 percent of colonies bleached (Bruno et al. 2001). Studies of Palau's corals looking at recovery from the 1998 bleaching event indicate that the RISL's fringing reefs had the highest coral cover. This suggests that they were less affected by the bleaching than the other regions of Palau (Golbuu et al. 2007a; Golbuu et al. 2007b) and potentially more resilient to increasingly more frequent and intense ENSO oscillations that are possibly caused by climate change. The shallow reef tops of the barrier reef in the RISL are another reservoir of bleaching-resistant coral (Colin 2009).

Fish, Sharks, and Rays

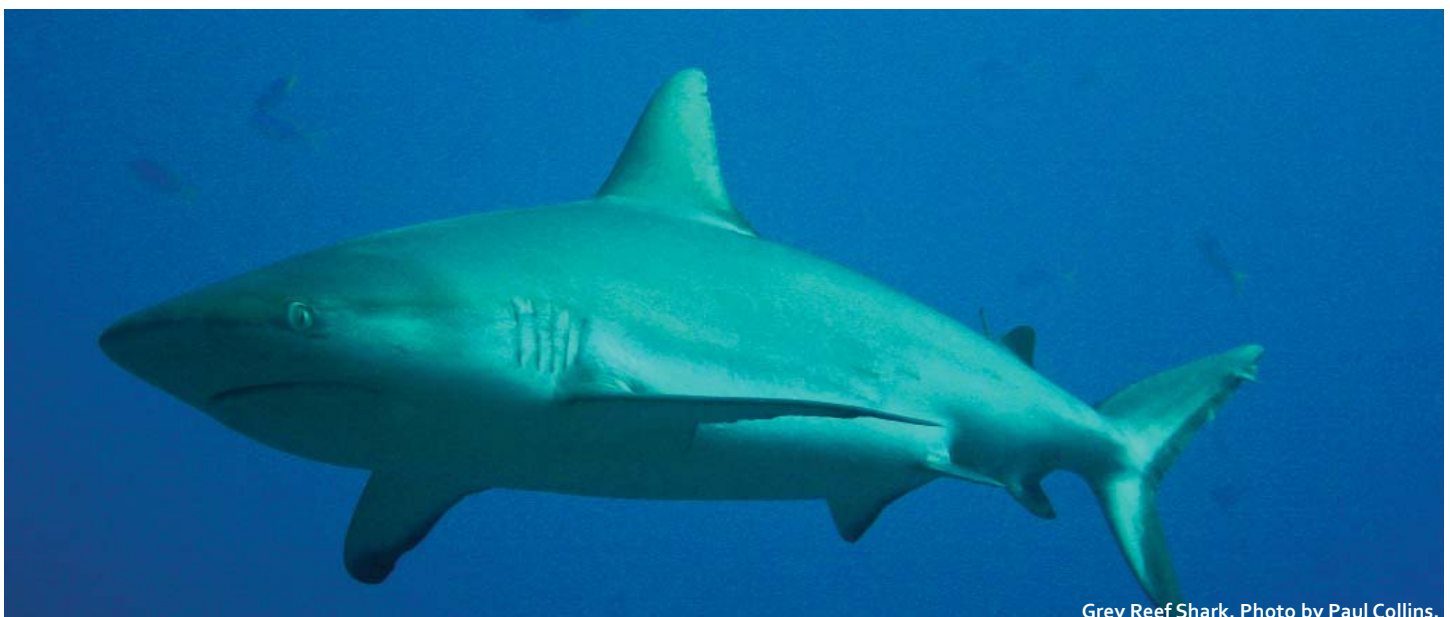
Of the more than 1,350 species of fish recorded in Palau, at least 746 occur in the RISL (Winterbottom unpubl.; Maragos et al. 1994). Ngerumekaol Channel alone has 89 recorded species of fish (Amesbury 1991) and is a well known grouper spawning aggregation site. The Ngerukewid Preserve has 150 fish species (Birkeland and Manner 1989). Palau is ranked fifth among the top 10 regions of high reef fish diversity (Allen 2000). Ongoing research continues to discover new RISL fish species (Winterbottom 2005; Winterbottom, Harold, Murphy 2005; Winterbottom, Iwata, Kozawa 2005).

At least 13 of 17 reported species of shark from Palau have been observed at the famous Blue Corner in the Ngemelis Complex within the RISL (T. Bornovski pers. comm. 2010) including resident populations of grey reef, black tip, white tip, and silver tip sharks, bull sharks, tiger sharks, nurse sharks, zebra or leopard sharks, thresher sharks, whale sharks, and even the Bronze whaler sharks. For nearly a decade Palau has banned commercial sharking finning and the use of steel leaders in its waters. In his annual United Nations address in 2009, the President of the Republic of Palau declared Palau a Shark Sanctuary, the first of its kind in the world. As all of Palau's waters are now a sanctuary, harvest of sharks is prohibited, including in the RISL. Palau's hope that other nations would follow their example was realized in 2010 when the Maldives also became a shark sanctuary.

Every year, more discoveries are made and more is learned about the many habitats within the RISL. For example, German Channel, a famous cleaning station for sharks and manta rays, is now also known to be an important feeding and breeding area for manta rays. Recently, two young mantas were observed and they are believed to have been born during 2010 (Olkeriil, pers. comm. 2010; Etpison, pers. comm. 2010).

Reptiles and Herpetofauna

The hawksbill sea turtle (*Eretmochelys imbricate*)



Grey Reef Shark. Photo by Paul Collins.



Hawksbill Sea Turtle. Photo by Paul Collins.



Emerald Skink. Photo by Eric VanderWerf.

nests in the Rock Islands. Palau's nesting population is the only one known in Micronesia (Maragos et al. 1994). In 2005 and 2006, beaches in the RISL had more hawksbill nests than any other recorded location in Palau. Satellite tagging results for the hawksbill sea turtle indicated that there may be a resident population in the RISL (Kitalong and Eberdong 2006; Klain and Eberdong 2007). Hawksbill sea turtles are listed by the IUCN as "critically endangered". The endangered green sea turtles (*Chelonia mydas*) is also found within the RISL. The trade of both hawksbill and green sea turtles is prohibited by the Convention of International Trade of Endangered Species (CITES), which Palau has signed.

Palau's salt water crocodile (*Crocodylus porosus*) is the island nation's only native crocodile (Russello et al. 2006) and Micronesia is the eastern edge of its distribution (Colin 2009). Adult and juvenile salt water crocodile are regularly observed in the RISL (Nash et al. 2008). A 2003 survey of crocodiles estimated the population to be between 500 to 750 non-hatchling individuals (Brazaitis et al. 2003). All of Palau's confirmed endemic herpetofauna are present in the RISL (Crombie and Pregill 1999). Individual Rock Islands or island groups are known to have endemic exclusive herpetofauna that include the following species: *Platymantis pelewensis*, *Gehyra brevipalmata*, *Gekko* sp. (undescribed), *Lepidodactylus*

paurolepis, *Lipinia leptosoma*, *Spenomorphus scutatus*, *Spenomorphus* sp. nov. (undescribed), and *Ramphotyphlops acuticaudus*. The endemic frog, *Platymantis pelewensis*, was found during a biotic survey of the RISL's Ngerukewid Preserve (Birkleland et al. 1989).

Mammals

The vulnerable sea cow, *Dugong dugon*, lives in the RISL and is frequently sighted. Palau's dugong population is the most isolated population in the world (Nishiwaki et al. 1979; Nishiwaki and Marsh 1985). Seagrass beds in the Ngederrak Reef Conservation Area are an important feeding ground and refuge for dugongs (Community Centered Conservation 2003). Of the total of 30 dugongs sighted during three aerial surveys in 2008, 24 (16 adults and 8 calves) were sighted within the RISL (Kitalong Hillman et al. 2008). Preservation of Palau's dugong population is particularly critical because, due to its isolation, there is less probability that the local populations will become established in other locales (Marsh and Lawler 1998). Anecdotal sightings have indicated that all species of small cetaceans and several species of large whales can be frequently sighted within the boundary of the RISL or in the eastern buffer zone (Whales Alive 2010). In 2010, Palau passed legislation establishing all of its waters as a Marine Mammal Sanctuary, prohibiting harvest of marine mammals. Research

Micronesian megapode Bekai

© Mandy Etpison



Dugongs. Photo by Mandy Etpison.



Dugong feeding trail through seagrass. Photo by Paul Collins.

on marine mammals in the RISL began in 2012. Bats are the only native terrestrial mammals in Palau. The Marianas flying fox (*Pteropus mariannus pelewensis*) is endemic at the subspecies level and is common in the RISL. Wiles (et al. 1997) observed large roosting areas in the RISL with a roost on Ngeruktabl Island containing as many as 500 bats. The Polynesian sheath-tailed bat (*Emballonura semicaduta*) inhabits cave ceilings in the RISL.

Birds

The Rock Islands are home to all of Palau's endemic, regionally-restricted, and endangered birds. 53 of Palau's 151 bird species have been observed in the Rock Islands (Pratt and Etpison 2008). All terrestrial habitats within the RISL have been designated an Important Bird Area (Holm et al. 2008). Many species are found in greater numbers in the RISL than in other locations. Engbring (1992) found Nicobar Pigeons (*Caloenas nicobarica pelewensis*) to have their highest population densities in the Rock Islands. The near-threatened Nicobar Pigeon population, hunted in other parts of the world, increased in the RISL between 1991 and 2005 (VanderWerf 2007). The Rock Islands may act as refugia for certain birds. The Giant White-eye (*Megazosterops palauensis*), endemic to Palau and previously only observed in the Rock Islands and Peleliu, was recently observed on Babeldaob (Olsen 2009). It likely originated from the RISL. The recolonization of all endemic birds in Peleliu following the devastation of World War II is also testament to the refugia property of the RISL.

Terrestrial Invertebrates

In a recent survey that included the Property, Rundell (2010) found that the number of land snail species found in Palau far exceeds previous estimates. Approximately 95 percent of the species are endemic to Palau with 15 of these found within the RISL (Rundell 2005). The Diplomatiniids are exceptionally diverse in Palau including 42 species of which 31 are undescribed.

Plants

Terrestrial

The RISL contains 55 (42 percent) of Palau's 130 endemic plants and 31 (23 percent) of these plants

are restricted to the Rock Islands (Costion et al. 2009; Kitalong et al. 2008). The steep, porous, and extremely rugged karstic substrate is species rich and includes the endangered *Cycas micronesica*, the endangered endemic palm, *Hydriastele palauensis*, and the critically endangered endemic *Ponapea palauensis*, known only from the RISL. Only two small populations of *Ponapea* are known, with single palms in few locations (Lewis et al. 2008; Kitalong, pers. comm.). It inhabits moist, sheltered pockets among the limestone. The Ngerukewid Islands Wildlife Preserve includes 113 native plants of which 30 are endemic, including *Hydriastele palauensis* (Birkeland and Manner 1989). On ten of Ngerukewid's islands, three endemic species, *Hydriastele palauensis* (5%), *Sterculia palauensis* (3%), and *Timonius subauritus* (3%), represented 11 percent of measured trees (Kitalong Hillman 2008).

Marine

The RISL has at least 119 species and 4 ecads of algae including 57 taxa and the 4 ecads of green algae (Chlorophyta), 16 brown algae (Phaeophyta), 35 red algae (Rhodophyta) and 5 blue green algae (Cynophyta). Omodes Pass within Nikko Bay (formerly Iwayama Bay) has an exceptionally rich algal flora with over 75 species. This pass (340m long, 130m wide and 3-4m deep), representing only a fraction of Palau's marine systems, contains nearly 40% of all algae species (195) collected or recorded (Ohba et al. 2007). A total of 22 algae species were found in the Ngerukewid Islands Wildlife Preserve (Birkeland and Manner 1989). Nine of the 10 seagrass species in Palau are found within the RISL (Ohba et al. 2007).

Exploitation of Natural Heritage

Harvest of Fish

Fishing is a popular activity in the RISL. Having practiced sustainable fishing for millennia, fish forms the core of the Palauan diet (Fitzpatrick and Kataoka 2005). Today the most common methods for fishing are bottom fishing, line fishing, and spear fishing (Matthews 2004). Archaeological data suggests that during occupation of the Rock Island stonework villages in the ancient past dropline fishing, used on squirrelfishes (Holocentridae), snappers (Lutjanidae), emperors (Lethrinidae),



and sea breams (Monotaxidae), changed to more reliable and productive techniques such as netting and basket traps, employed on the parrotfishes (Scaridae), leatherjackets (Aluteridae), porcupinefishes (Diodontidae), and wrasses (Labridae), during occupation of the Rock Island stonework villages (Masse 1989).

Both commercial and non-commercial fishing occurs in the Property, although there is limited fish export from these catches. Harvesting of fish is regulated in the Property. For example, the Ngkisaol Sardines Sanctuary was established specifically to protect sardines. Additionally, the sale of sardines is banned at all times in Koror and harvesting of sardines is prohibited throughout the Property two days before and on the day of the full moon.

Harvest of Invertebrates

The harvest of invertebrates is regulated by state and national laws. Most invertebrates can be harvested for local consumption, such as the seven giant clam species (*Tridacna* sp., *Hippopus* sp.). Cultured giant clams are commercially exported but there is no export of wild giant clams, sea cucumbers, mangrove and coconut crabs, or lobsters with exceptions for research purposes. The top shell, *Trochus niloticus*, has been harvested for its meat and shell since the 1930s. Harvested trochus shell must have a minimum base diameter of 3 inches. Harvests are usually every 3 years for a one month period in June when the Palau National Congress declares an open season (Palau Marine Protection Act of 1994). Ngederrak Reef is a permanent conservation area where harvesting of all marine life including *Trochus* is banned. However, harvesting is allowed in some areas of the RISL and invertebrates including crustaceans (e.g. crabs and lobsters), mollusks (e.g., clams, trochus, and oysters), sea cucumbers, and sea urchins are still collected from the Property.

Harvest of Turtles

Turtles play a significant role in the traditional Palauan culture and their harvest is legal and regulated. The Palau Marine Protection Act of 1994 placed size and seasonal restrictions on sea turtle harvest, and prohibits harvesting of eggs or nesting females. Hawksbill sea turtles are primarily

harvested for their shells, which are used to make traditional items such as *toluk* (a form of women's money) and non-traditional items such as jewelry, hair accessories, and other items that are bought by both tourists and locals. Adult green turtles are harvested as a food source. Harvesting of turtle eggs, also considered a food source, is illegal although poaching occasionally occurs. There is some support for decreasing turtle exploitation, with the 2004 National Women's Conference advocating a 20-year moratorium on all turtle harvesting. In December 2010, the Palau National Congress declared a 5-year moratorium on the harvest of Hawksbill sea turtles.

Harvest of Birds and Bats

There is commercial and subsistence harvesting of fruit bats in the RISL. Regulations prohibiting the export of fruit bats came into force in 1994 and subsequently reduced hunting pressure. Fruit bat numbers increased in Palau between 1991 and 2005 (Wiles unpubl.). Although most birds in Palau are protected by the Protected Land Life Law, poaching does occur. Micronesian Pigeons (*Ducula oceanica*) are a primary target because they are an important customary food and considered a delicacy. Between 1991 and 2005, the number of Micronesian Pigeons declined in the Rock Islands (VanderWerf 2007).



Netfishing for reef fish. Photo by Ann Kitalong.

A personal tour of wonders in the Rock Islands Southern Lagoon

Ron K. Leidich, an avid naturalist with more than 16 years exploring islands in Palau and the rest of the vast Indo-Pacific basin, highlights some unique features of Palau's Rock Islands.

"I've chosen three sites which highlight the bizarre nature of Palau's geological processes leading to fantastic marine environments the likes of which can be seen no where else on earth," says Leidich.

Oasis Lake (also known as Pincher's Lake (Colin 2009)) is one of the smallest lakes in the RISL, yet its center drops to a depth of 12 meters. Surrounded by tall, castle-like walls, the interior of the lake remains undisturbed, even when typhoon-strength winds are raging outside. Despite the isolated nature of the lake, tidal seawater continuously bathes the corals via a narrow intertidal opening perforating the limestone barrier. Thus coral larva, nutrients, and even fish can be carried through this macroscopic tunnel with each tide into a completely pristine environment. The corals within the lake represent a diverse assemblage of shade tolerant species. Free from physical disturbance, the corals have colonized every square centimeter of available space.

Habitat space is at such a premium



A researcher at an entrance to Oasis Lake.



Pachyseris coral baskets in Oasis Lake.

that corals are growing over the top of one another competing in the "high rent district" of this busy coral city. Every night, veteran corals extend and wave their sweeper tentacles armed with stinging cells in the battle for precious space. The multi-colored profusion of *Favites*, *Favia*, *Goniastrea*, *Lobophyllia*, *Porites*, *Pavona* and *Heliofungia* corals provide a spectacular array of diversity, shape, and color. The cathedral-like walls have provided yet another bizarre twist to the coral growth. Left undisturbed, many species of corals have responded by growing into enormous baskets. Normally found as encrusting forms, these baskets have formed alarmingly fragile skeletons, so thin that a diver's light can penetrate the hard skeleton. These exquisitely stunning forms can grow up to the low tide line creating mirrored reflections from the windless surface. This multi-genera assemblage of ancient giants includes *Echinopora*, *Merulina*, *Oxypora*, *Pachyseris*, and *Montipora* baskets. In one exceptionally well protected corner of the lake, *Echinopora* baskets have split into radiating arms standing over two meters tall. The slightest motion of the water causes these leviathans to sway back and forth.

Einstein's Coral Gardens: Many of the marine lakes and coves have delayed and dampened tidal cycles, but nevertheless rise and fall with the tides. The constant tidal flow has a powerful erosive effect on the porous islands, eventually creating sizable tunnels. Leidich refers to this geologic process as "lunar erosion." One particularly grand lake is tidally



A tunnel leading to Einstein's Garden.

fed by twin tunnels at its northern end. Nutrient rich lagoon waters are funneled in and out of the lake daily, bathing a multi-colored coral garden with the nutrients required to sustain their slow growth. The tall walls of the lake prevent winds and waves from damaging the reef, further protecting the age and beauty of the environment. Overhanging trees growing along vertical walls cover the coral garden in shade, and thus prevent aggressive sun loving species from taking hold. As a result of this specific recipe for coral growth, just a single species of coral dominates this marine habitat. Giant, multi-colored brain corals of the genus *Lobophyllia* carpet the sloping reef walls. Red, green, lavender, pink and gold brains are piled one on top of the other forming an un-replicated marine environment.

Mandarin Fish Cove is an exquisite turquoise inlet that is one of five coves within the protection of the magical Risong Bay. The ancient tunnel system feeding Mandarin Fish Cove has collapsed, leaving a narrow winding entrance just large enough to accommodate two kayaks abreast. The shallow water entrance slips down to a depth of 6 meters in one area and to over 12 meters in the deepest section. The circumference of the bay is surrounded by spiraling walls covered in a lush jungle canopy with hanging mosses

and carnivorous *Nepenthes* pitcher plants. Mandarin Fish Cove is further enhanced by its association with an even deeper land-locked lake, known as Surgeon Fish Lake (also known as Risong Lake (Colin 2009)). The two bodies of water are connected by an artesian connection of siphon tunnels and pores. During extreme outgoing tides, water rushes from Surgeon Fish Lake spilling into Mandarin Fish Cove in a cascading salt water waterfall. The sound of the splashing water can be heard from across the 30 meter wide cove. Incoming tides thus provide a "super-flow" of water and nutrients into Mandarin Fish Cove as a single tide cycle must simultaneously fill both bodies of water. As a result, the narrow entrance leading into the cove is flushed by a river of tidal seawater. Giant pink gorgonian sea fans (*Melithaea* sp.) are bathed in life-giving nutrients in only 1.2 meters of water. The increased nutrient flow has created an outer reef-like environment in what would otherwise be a relatively stagnant pool. Dining on this nutrient soup are schools of Cardinal Fish, surface feeding bait fish and juvenile fusiliers, who in turn feed a host of predators. Baby cuttlefish use the cove as their private nursery practicing their predatory arts before moving on to the bigger prey of the outer reef. Amongst the stunning corals of *Psammacora*, *Hydnophora*, *Porites* and *Anacropora* are the cove's namesake, the multi-colored

Mandarin Fish (*Synchiropus splendidus*), which emerge every afternoon as shadows fall over this secluded marine paradise.



Corals in Einstein's Garden.



Synchiropus splendidus.



Mandarin Fish Cove from the air.

2.a2 Description of Cultural Heritage

Palauan cultural sites in the RISL are listed in **Table 6** and represent the sites and location recorded in archaeological survey work by Osborne (1966, 1979), Masse et al. (1982), Snyder (1985); Masse (1989), Snyder and Butler (1997) and archaeologists from the Bureau of Arts and Culture. Due to the number and complexity of many cultural sites in the RISL this dossier reports details of representative

sites on Ulong Island, Ngeruktabel Island, Ngeanges Island and in the Ngemelis Group (Dmasech Island and Uchularois Island) (**Figure 5**).

Ulong Complex

The Ulong Complex consists of three major and three minor raised coralline reef islands (**Table 1**). Once a single limestone landmass, the three islands are now separated by shallow tidal channels formed

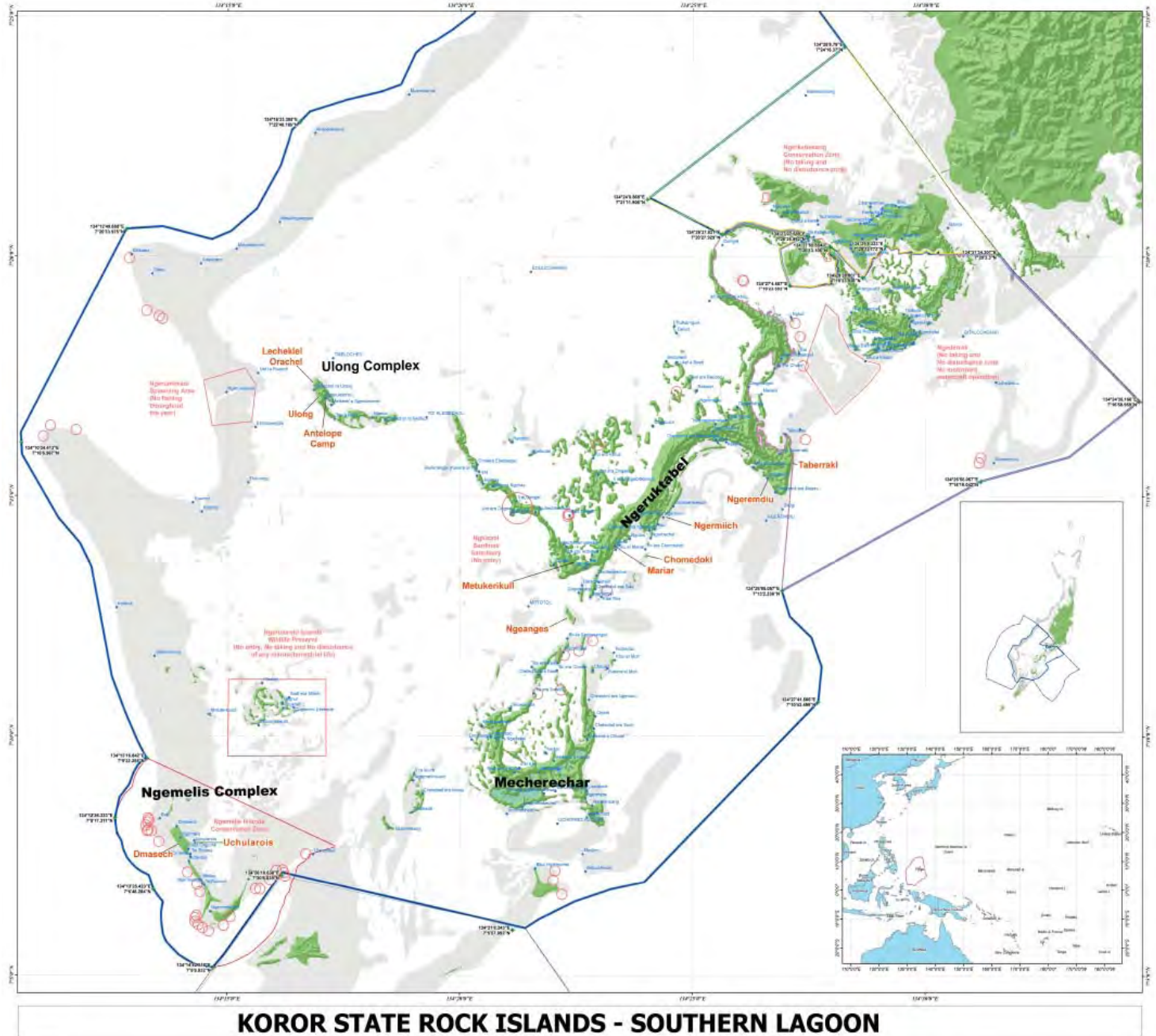


Figure 5. Location of cultural sites detailed in this dossier (in orange).

by wave erosion (**Figure 6**). The largest island of the complex, Ulong, is a high, rugged landmass composed of layered limestone oriented along a northwest azimuth. On its west side, Ulong has one of the largest of the Rock Island sand beaches. Otherwise it is bordered by an erosion notch punctuated by small coves and beaches. The beach flat is bounded on the east by a steep cliff face that rises 30-60m and splits into two arms to form a large, sheltered cove in the southeast. The karst terrain contains numerous sinkholes and two marine lakes. Like other Rock Islands, Ulong is heavily vegetated with coconut palms (*Cocos nucifera*) and several introduced vine species on beach areas and native trees, dominated by *Hydriastele palauensis*, *Semecarpus venenosus*, and *Cordia subcordata*, more common to the limestone substrate. Animal species frequently observed on the island are the megapode (*Megapodius laperouse senex*), introduced rats (*Rattus* spp.), and Common tree snake (*Dendrelaphis lineolatus*). A tourist structure equipped with a fireplace and seating is located on the beach flat along with a toilet block. Signage, now in poor condition, with information about the stonework village site is located to the south.

Oral history

Palauan traditions recount how Osilek, the rich chief of Ulong, married the beautiful Oreng. Another version: Oreng's mother was widowed and indebted to the generous Osilek who fed her. Oreng's mother asked her daughter to marry Osilek as she had no other means to repay his generosity. Oreng respected her mother and consented to marry Osilek although she was truly in love with Mariar of Metukeruikull Village in the nearby Island of Ngeruktabel. Mariar died from a broken heart when he heard that Oreng had married Osilek. When the news of Mariar's death reached Oreng, she travelled to Metukeruikull for the funeral and was found dead embracing Mariar's corpse. In another story, Osilek forced Bieb of Ulong to marry him when she was in love with Matkerumes from Ngeanges Island. Bieb contracted a disfiguring disease, but was cured by Matkerumes with *ditmechei* (ti, *Cordyline terminalis*). When the couple was departing Ulong, Bieb's mother tearfully followed them into the sea and turned into a clam,

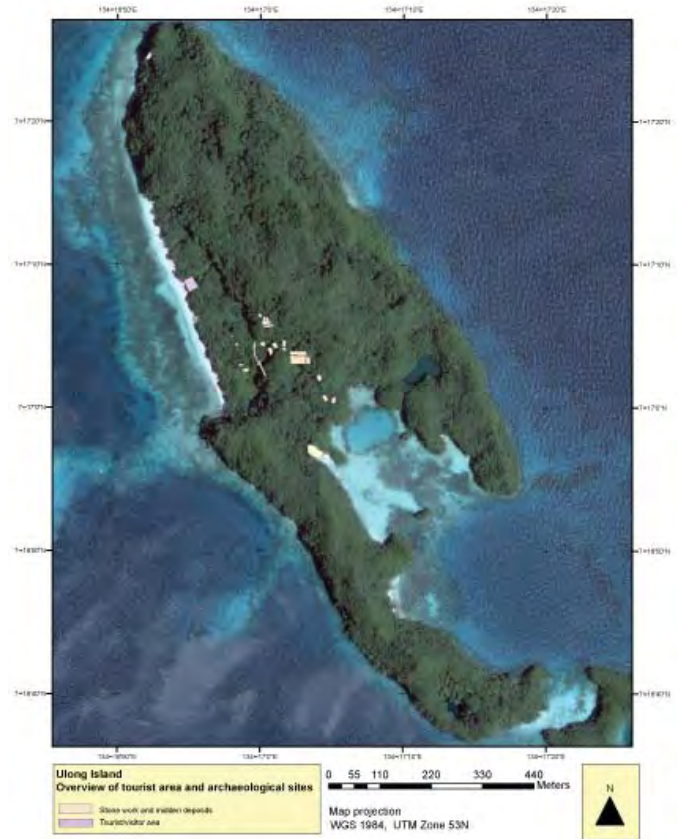


Figure 6. Ulong Island archaeological sites and tourist facilities. Photo Clark/Reepmeyer – ANU

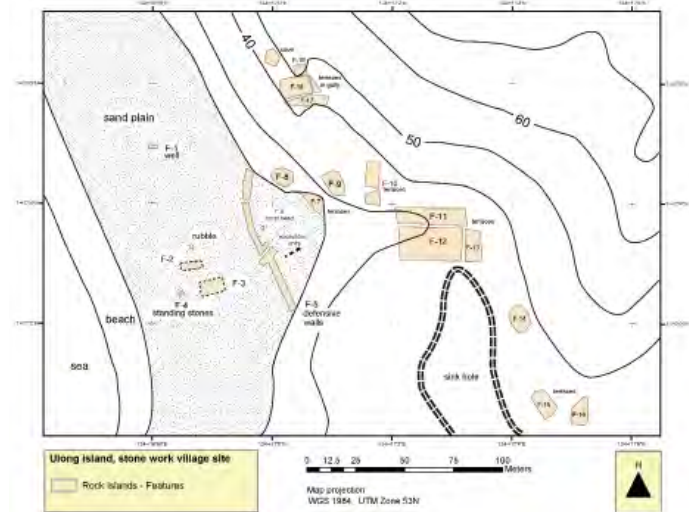


Figure 7. Ulong stone work village features. Clark/Reepmeyer – ANU

whereupon Bieb dove into the water to join her mother. The story warns that those who own a *bieb* (Biib, Palau Fruit Dove, *Ptilinopus pelewensis*) should not eat or bring clams into the house.

The attack on Ulong by warriors from Ngemelis is recorded in the proverb “*ko er a mekemedil a Ulong el dob er a kebesengei*” (“like the war at Ulong, which came in the evening”; Parmentier 1987:288). After



Figure 8. Ulong stone work village defensive wall.
Photo Clark/Reepmeyer – ANU

In Palau’s oral traditions, the demi-god Uodel instructed the women of Ngerkesoaol village to stand on Toker hill in Oreor (Koror) and wave their ceremonial *telutau* mats toward the west for one month. As a result, the *Antelope* wrecked on Ulong in AD 1783 and Koror became rich and powerful by gaining access to the foreigner’s exotic goods and powerful weapons (Nero 1987:197-198). *Telutau* mats are associated with the gods and according to this story it was Palauans acting at the command of, and through, their local gods that brought the foreigners who played such a decisive role in Koror attaining wealth and status (Nero pers. comm.; see Krämer 1926:141-142).

Cultural sites

Ulong Island has the most significant set of cultural remains in the Rock Islands. The island contains four significant sites that span Palau’s historical sequence from human colonization over three thousand years ago to early European contact in the 18th century, in addition to a spectacular rock art gallery.

The Ulong cultural sites include:

- The oldest cultural deposit in the Palau archipelago dating to 3100 years ago.
- An intact stonework village system dating to the last 1000 years. The abandoned stonework village, located on the southwest beach flat and surrounding limestone slopes, includes a large defensive wall fronting the beach and trails to stone terraces, walls, and platforms in the limestone. Associated with the stonework are thick deposits of shell midden and pottery.
- The survivor camp of the East India Company packet the *Antelope* which was wrecked on the west barrier reef of Palau in AD 1783. The well-preserved remains of the camp and textual records of the encounter are a unique record of initial cultural contact between Pacific Islanders and Europeans.

their defeat, the people of Ulong fled to the volcanic island of Ngerekebesang in Koror, where the chief of Ulong had forged a recent alliance. Others from Ulong moved to Ngaremlengui and to Ngeburech village near Melekeok on the island of Babeldaob. After a number of years, the Ngaremlengui group decided to join those in Ngeburech. Without a sufficiently large money bead to repay their Ngaremlengui hosts for their past hospitality, the immigrants made payment by repaving the stone paths and platforms of Imeong village (Snyder et al. in prep.). After their defeat, the Ulong people traded a famous piece of curved money bead (*bachel*) known as *Kedam* to acquire land and relocate to Babeldaob (Osborne 1966:403, Figure 120, Frontispiece g).

Table 1. Islands of the Ulong Complex

Island Complex	Number of islands	Land area (km ²)	Shoreline length (km ²)	Shioya sand (km ²)	Limestone outcrop (km ²)
Ulong Complex	6	1.19	14.49	0.05	0.87

a unique record of Palauan material culture and lifeways, particularly human use of the marine ecosystem over a 2500 year period.

2. Stonework village system: Ulong Village contains several stone features, including a large defensive wall, a walk-in well on the beach flat, and several terraces and stone platforms on the slopes and ridges to the south and east. The village remains have a dispersed pattern similar to other Rock Island village sites, with occupational deposits divided between a concentrated midden deposit on the beach flat and dispersed stone features lacking dense midden remains in the limestone. Access to terraces, platforms, and sinkholes where taro and other crops were grown in the karst terrain was frequently protected by stone walls crossing trails and gullies. More than 16 stone features (**Figure 7, Appendix B**) were observed in the 2010 survey which followed the substantial investigations of Osborne (1966, 1979) and Masse et al. (1982). 2010 work recorded additional terraces (F-16 to F-18) and a burial cave in a recess of the limestone cliff to the north of the main village. The Ulong stonework village system displays an array of significant stonework features and cultural remains in beach sediments, caves, and sinkholes.

Village features

The main stonework feature is a defensive wall (F-5) (**Figure 8**). The wall, measuring approximately 80m long, 3-4m wide, and up to 1.5-2.5m high, has two entrances. Sections of the dry-stacked feature are well preserved especially in the north and just south of the first entrance. The wall consists of medium-to-large coralline limestone boulders (maximum boulder size = 80cm x 80cm x 40cm). An 85cm high and 120cm deep step on the wall's interior allowed defenders to guard against attack from the beach. It protected access to the occupied interior and enclosed the village's eastern section. This portion of the village is archaeologically distinguished by a dense concentration of ceramics, midden, and shell tools descending to 60cm below surface. Outside the wall are the remains of stone platforms and an unusual feature composed of four deeply buried limestone blocks that extend 50cm above ground surface and form a 70cm square. The stones appear



Figure 9. Ulong Antelope survivor camp AD 1783. Courtesy of the National Library of Australia

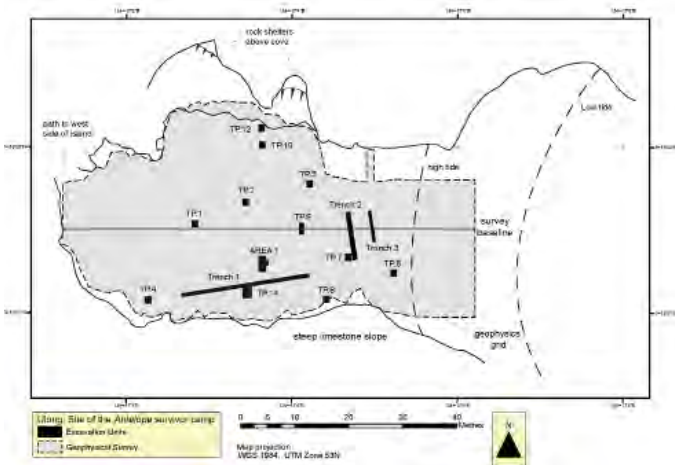


Figure 10. Ulong investigations at the Antelope survivor camp. Clark/Reepmeyer – ANU

- A complex of caves and a large eroded overhang marked with a diverse and sophisticated assemblage of red-painted rock art that is unrivalled in Micronesia.

1. Early human settlement: The oldest cultural site in the Palau archipelago is located in the southwest of the island where subsurface deposits have been dated to span the period from 500 to 3000 years ago (Clark 2005; Clark et al. 2006). Deposits of a similar age have not been located on the volcanic landmasses due to island subsidence, the burial of coastal sites beneath eroding upland sediments, and the presence of highly acidic soils that chemically degrade prehistoric remains. Stratigraphy at the Ulong site extends to a depth of 2.5m and holds



Figure 11. Ulong red-painted rock art. Photo Mark Willis

to be foundation posts for a small structure which could be a stonework village shrine like those found on Babeldaob.

Similar midden deposits are found within and outside of the wall with the latter distinguished by the presence of shallow human burials. Both areas of the beach flat have been subject to archaeological excavation starting in 1966 with Osborne (1979) and more recently by a team from the Australian National University (Clark 2005; Clark et al. 2006). Recovery of a large quantity of stone tools and ceramics manufactured on the volcanic islands highlights the close relationship between Palau's limestone and volcanic islands. To illustrate this, 17kg of pottery was recovered from the upper 60cm of a 1m² unit excavated inside the defensive wall. If only half the amount of pottery in the 1m² excavation is present in the zone of dense village midden (>6400 square meters) then at least 60,000kg of pottery was brought to the Ulong village site from the volcanic islands.

Based on stratigraphic and radiocarbon results the Ulong village stonework dates to 950-550 years ago. Ulong was probably abandoned around AD 1600 as the village and the entire island group were uninhabited at the time of the *Antelope* shipwreck

in AD 1783 (**Appendix C**). The early date is also suggested by Ulong's oral traditions which are associated with the period Ngerekebesang was the high-ranking village, thus apparently predating the first Ibedul of Koror who came to power in the 1700s (Nero 1987:125, 126-127).

3. Survivor camp of the packet *Antelope*: European maritime expansion in the 18th century had a momentous effect on many indigenous Pacific societies. The preservation of sites exemplifying and illustrating the initial contact and interaction between the West and the Pacific are extremely rare. The *Antelope* survivor camp on Ulong is one such site. In AD 1783, a British East India Company packet, the *Antelope*, commanded by Captain Henry Wilson, struck the outer barrier reef of Palau several kilometers north of Ulong. The event initiated sustained and significant contact between the people of Palau and the world's colonial powers. For the next 200 years Britain, Spain, Germany, Japan, and the United States played a role in Palau's development.

The *Antelope's* 49 crewmembers established a camp in a protected cove on Ulong's south side (**Figure 9**). Palau's oral traditions record this momentous event of first sustained European contact; an event that would

lead to the elevation of Koror in Palau's hierarchically structured society. The poet and playwright George Keate (1789) wrote an immensely popular book based on the crew's experiences entitled *An Account of the Pelew Islands*. A recent archaeological and geophysical study relocated the remains of this camp to provide exceptional documentation of the history of contact between the shipwrecked crew and Palau's chiefs and commoners (Clark and de Biran 2010; **Figure 10**).

At the time of contact, the two major political entities competing for superiority in Palau were Koror (headed by the Ibedul) and Melekeok (headed by the Reklai). Communication between the Ibedul of Koror and the British-Chinese crew on Ulong was facilitated through a shipwrecked Malaysian who spoke both languages. The Ibedul used the *Antelope's* crew and their weapons to gain an advantage over Melekeok to the north and Peleliu to the south. Koror was hence able to establish itself as the central place in Palau, a position that it maintains today. Important connections were made with the East India Company and Britain through the Ibedul's second son, Lee Boo, who travelled to London with Captain Wilson before dying of small pox in December 1784.

The historical significance of Lee Boo's journey to Britain is marked in the landscapes of both countries. In London, there is a Rupack [Rubak, "male elder"] Street and Captain Henry Wilson's retirement home in Colyton, currently listed as a British heritage property, is called "Oroolong House" [Oroolong = Ulong]. Lee Boo is buried in the churchyard at Rotherhithe, England. His tomb bears an inscription written by George Keate: "Stop, Reader, stop! – let Nature claim a Tear – A Prince of Mine, Lee Boo, lies bury'd here." Palau displays a statue of Lee Boo on the grounds of the Palau Community College. The statue's plaque reads in part: "While in London, Prince Lee Boo became Palau's de facto ambassador of goodwill to England and Palau's first true scholar." Painted on the nearby *bai* (men's meeting house) is a sequence of pictographs illustrating the arrival of the *Antelope* and subsequent events from a Palauan perspective. There are memorial tablets to British-Palauan

relations on the west side of the beach on Ulong, in St. Mary's Church, Rotherhithe, UK and in St. Andrew's Church, Colyton, UK.

4. Rock art overhang and associated caves: A large overhang on Ulong's northwest coast holds one of the premier painted sites in the Pacific, a dense and spectacular concentration of red rock art (**Figure 11**). Called – *lecheklel* Orachel (Orachel's drawings), traditions say that the Ulong rock art, and the smaller assemblages identified on five other Rock Islands, was made by the culture hero Orachel. He is also known for discovering the secret to making and decorating the wooden *bai* structures. His brush was a quill made from the coconut spathe and paint made from charcoal, squid ink, and red pigments. Orachel's final drawing made while he was turning to stone was the spectacular rock art on Ulong.

Within Palau painted and engraved examples of rock art are extremely rare with only six art sites known from limestone islands and one petroglyph-marked boulder on Babeldaob (Liston and Reith 2010). Four of the painted art sites on limestone islands consist of relatively small groupings of red/white painted designs (Ongellungel ra Ongesil, ~1 figure/design, Ongellungel ra Ngeberdel, ~5 figures/designs, Ngeremid Ichum, ~2 figures/designs, Oimad er Merach, ~4-5 figures/designs (McKnight 1964). The rock art is painted in red ochre and is characterized by finely drawn stylized and diverse motifs. Designs noted by Schmidt (1974) include the four-pointed star, circle within a circle, and stylized fish, faces, and human figures.

At Taberrakl on Ngeruktabel Island and Olechuklars Ulong on Ulong Island there are significant areas with red rock art. The Taberrakl site is a cliff overhanging two rock ledges with painted designs dominated by more than 20 red palm prints in addition to human stick figures, a canoe and mythological figures. In the 1960s the art was described as faded and damaged by natural flaking of the exposed limestone surface. The Olechuklars Ulong site consists of a large overhang and associated cave complex about 15 m above sea level on the west side of the northernmost island in the Ulong group (part of the art gallery is recorded in



Figure 12. Ulong red-painted rock art in fissure. Photo Mark Willis



Figure 13. Ulong rock art in cave interior. Photo Mark Willis



Figure 14. Ulong graffiti over rock art. Photo Clark/Reepmeyer – ANU

Gregory and Osborne 1979:Fig. 211). The red art is concentrated in the overhang and extends up the cliff in fissures and solution channels with sparse art located in panels and pockets in cave interiors (**Figure 12, Figure 13**). The stylized designs are generally well-preserved, highly diverse and exhibit greater artistic attention than art at other sites as described by McKnight (1964:22): “The paintings at Ulong are so numerous and distinctive that one observer was led to make the statement that Ulong is the ‘dictionary’ for the other cave painting sites ... The main difference is the quality of the workmanship. While any of the paintings at Taberrakl are accomplished with crude brush-like strokes, most of those at Ulong are neatly finished”.

Archaeological investigations at the early site south of the beach unearthed non-local ironstone artifacts from contexts dated from 3000–2000 years ago. The ironstone had been abraded to obtain iron oxide pigment. Analysis of the rock art pigment indicates this ironstone may have been the pigment source, suggesting that the Ulong rock art has considerable antiquity and is among one of the oldest art sites in the Pacific (Clark 2005).

Elsewhere in Micronesia painted rock art is known from cave locations in the Marianas, Commonwealth of the Northern Marianas and Pohnpei has a engraved art site called Pohnpaid/Takai-nin-Talang that is described as being “not comparable within the region” (Rainbird 2004:196). Liyang Gadao (Guam) is a small shoreline cave above Inarajan Bay with about 50 images made in white pigment representing human/animal figures. Other caves on Guam with rock art at Talofofo, Ritidian, Mergagan Point, Hinapsu and Fadian are mostly painted in white or black pigment, with red-painted art such as hand prints uncommon. Liyang Kalabera (Saipan), has more than 50 images dominated by linear/rectilinear images of human beings, often headless, rendered in white paint probably of slaked lime (*affuk*). Unai Dangkull (Tinian), is an engraved art site located outside on beach rock exposure 7–10 m from the high water mark. The site contains around 50 images including human stick figures without heads, cupules and turtle figures. Liyang Chugai (Rota) is a large

cave system with black pigment images located outside reach of natural light. Images include anthropomorphic and zoomorphic geometric images including sea turtles and a bill fish.

The painted and engraved rock art of the Marianas Islands is largely figurative and consists of human-like and animal-like forms. The frequent absence of the head on linear human-like figures is interpreted as reflecting ancestor worship involving the curation of skulls. In Chamorro society historical texts record that after death and bodily decomposition the skull was brought to the descendants' home where it provided direct communication with the ancestors who assisted the living in matters involving conflict, farming, fishing and hunting (Russell 1998:153-156). A relationship between rock art and the ancestors is further indicated by the use of human limb bones to manufacture tools and weapons which is matched by rock art paintings of human figures in which the upper and lower extremities of the body are absent (Cabrera and Tudela 2006).

In comparison to other art sites in Micronesia the red-painted rock art site on Ulong displays a diversity and sophisticated level of execution which is not found in painted sites in other parts of Palau or Micronesia. Previous recording and documentation of the Ulong art site by McKnight 1964, Schmidt (1974) and Osborne (1979) involves only a portion of the total art assemblage (a comprehensive photographic study of the site was commissioned by the Bureau of Arts and Culture in 2011). The Ulong red art is finely painted on the weathered cream-white limestone and is visible from the sea in front of the overhang with a smaller number of individual and groups of individual designs located out of sight deep in nearby caves. Analysis of the Ulong designs with rock art from Island Southeast Asia and Melanesia does not reveal close parallels with rock art assemblages in neighboring regions (Schmidt 1974; Gregory and Osborne 1979), and the Ulong designs are also unrelated to those of the Mariana Islands by the absence of linear human/animal figures that are particularly associated with late-prehistoric Chamorro mortuary activity.

The Ulong rock art is also unlike the historically recorded iconography of *bai* (Palau community house), which employ naturalistic designs with the key element comprising dynamic human forms (Liston and Reith 2010). The red rock art at Ulong is geometric, elaborate, and abstract with few anthropomorphic shapes and probably dates earlier than the Stonework village era which is associated with *bai* architecture (~AD 1200-1600). The well-preserved rock art on Ulong may be a territorial marker in the Rock Islands or be associated with cave burials although no interments have been yet recorded from nearby caves nor is rock art a feature of known cave burials in other parts of the Rock Islands. As the red painted art is associated with cave sediments it is likely that future archaeological investigations will assist in understanding the symbolic meaning of the Ulong rock art.

Of concern is the large quantity of historic graffiti in the main overhang. The graffiti, consisting of painted/scraped and incised text, has destroyed the prehistoric art in several parts of the complex. Some disturbance may date to WWII use of the island by Japanese military forces. However, there is a significant increase in the amount of destructive graffiti associated with recent tourist visits (**Figure 11**).

Ngemelis Complex

The Ngemelis Complex is a cluster of eight low-lying Rock Islands at the western edge of the RISL barrier reef system (**Figure 15; Table 2**). The islands, surrounded by broad beaches of calcareous sand, are narrow jagged ridges of coralline limestone rising above sea level an average of 10-15m. Broad tidal sand flats holding plentiful stocks of marine shell and fish bound the east side of the four largest islands, while the fringing reefs largely surrounding the island group are excellent fishing grounds. The Ngemelis Complex is heavily vegetated with sandy beach flats dominated by coconut trees, *Cocos nucifera* (*lius*) and wax apples (*rebotel*, *Eugenia samarangense*) while ironwood trees, *Casuarina equisetifolia* (*ngas*) and vines and lianas (*Rhaphidophora spathacea* (*oliich*), *Derris trifoliata* (*kemokem*), *Salacia chinensis* (*detimel*) cover the limestone ridges.



Figure 15. Dmasech Island archaeological sites and visitor facilities.

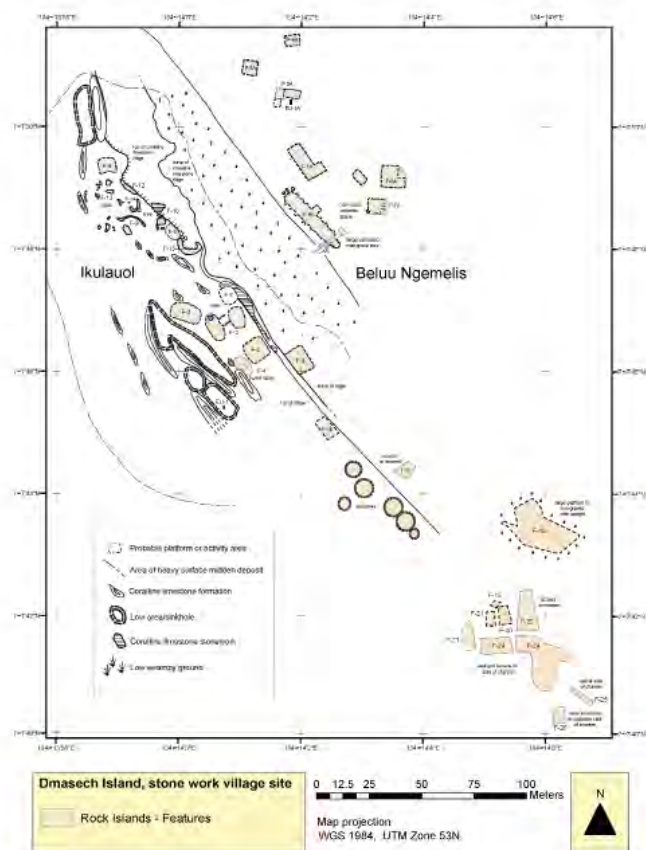


Figure 16. Dmasech stone work features.

The Ngemelis Complex is traditionally linked with the village of Ngerchemai on Oreor and the chiefly title of Obechad. This title is associated with the islands of Ngemelis, Ngerukuid, Ngercheu, Ngedebus, and half of Ngerchong island. In traditional history, Obechad was the No. 2 chief of the Mecherchar-Ngerchong polity and lived on Ngerchong while ruling the Ngerukeuid and Ngemelis Groups (Snyder et al. in prep.).

The islands within the Ngemelis Complex are part of several oral traditions including one of Palau's most famous, the discovery of the turtle's egg laying cycle (Palau Community Action Agency 1971). Traditions also relate how Terebkul of Peleliu and Chief Uchermelis of Ngemelis attacked the settlement of Ulong which was oppressing Ngemelis (Osborne 1966:401-403; Nero 1987:195).

Uchelmelis and Terebkul painted their red war canoes white so they would be hidden by the sunlight during their sunset attack on Ulong. In one version of the story, the people of Ngemelis moved to the north shore of Babeldaob's Ngeremeduu Bay after the defeat of Ulong because of a severe food shortage (Snyder et al. in prep.). The Ngemelis Complex was later occupied by survivors from the Ngeruangel storm around AD 1700.

Archaeological remains have been recorded on five islands—Ngis, Belual a Kelat, Dmasech, and Uchularois—with only the latter two having received detailed survey and archaeological work. It is likely additional sites are on the unsurveyed islands of Desomel, Lilblau (also spelled Ielblau), Cheleu, and Bailechesengel (Osborne 1966; Masse et al. 1982; Masse 1984).

Table 2. Islands of the Ngemelis Complex

Island Complex	Number of islands	Land area (km ²)	Shoreline length (km ²)	Shioya sand (km ²)	Limestone outcrop (km ²)
Desomel, Ngis, Belual a Kelat, Dmasech, Uchularois, Lilblau, Cheleu, Bailechesengel	23	1.41	19.52	0.30	0.88



Figure 17. Dmasech stone work F-5A. Photo Clark/Reepmeyer – ANU

Dmasech Island

Dmasech Island is 1200m in maximum length and 450m in maximum width. A narrow, 4-8m high, ridge of coralline limestone extends the length of the island. Parts of the island, particularly on the east, consist of low-lying beach that extends up to 250m wide. A small mangrove swamp is present in the southern half of the island, while the northern half contains swampy areas holding small quantities of giant swamp taro (*Cyrtosperma merkusii*).

There are several midden deposits ranging in size from 2500m² to more than 10,000 m² on the eastern beach with marine shell, fish bone, and ceramics down to 80cm in depth. The deposits also contain a variety of shell and stone tools and ornaments, particularly adzes, gouges, scrapers, and shell rings (Table 3). The midden deposits are connected to the coralline features to the south by a stonework causeway/walkway (Masse et al. 1982).

These features form a large concentration of more than 24 well-preserved stone platforms, platform-

like areas, walls, and related stonework in the center of the island (Figure 16). The stonework complex is divided by a narrow swampy area into two sections; one section is on the low-lying beach flat to the east of the limestone ridge, and the other section is on top of the limestone ridge. Local tradition calls this area ‘Beluu Ngemelis’, with signifies it is the central village of the region.

Consisting of well-constructed accumulations of limestone blocks, the platforms on the beach flat are of variable size and shape. One particularly large and complex platform (Figures 16-17, F-5A) is suggestive of a men’s house (*bai*), and is a unique structure in the Rock Islands. The nearly level platform is 36.0m long with an average width of 6.0-7.0m, and a maximum height of 1.4m. What distinguishes the platform is a series of small, semi-circular to rectangular extensions protruding from the sides of the larger rectangle. Three pairs of matching extensions are located on both sides of the platform’s north section. The purpose of these extensions are not known, their regularity in size and spacing, however, suggests a structural function.

Near Feature 5A is another significant platform (F-7A). The platform displays a large (30cm x 65cm) volcanic boulder cornerstone that had to have been imported from the volcanic islands. It is the only volcanic stone found which may have a structural purpose. A concentration of smaller volcanic rocks was found on a large irregularly shaped platform in the center of the mangrove swamp to the south (F-18, described in detail below).

The section of the stonework village on top of the limestone ridge is a linear cluster of platforms and

Table 3. Marine shell species used to make Rock Island tools and ornaments

Species	Adze (blades)	Adze (small)	Chisels	Gorgets	Knives	Ornaments / shell money	Peelers/ scrapers	Spoons
<i>Anadara</i> sp.		x	x		x		x	
<i>Cassis</i> sp.		x	x		x		x	
<i>Conus</i> sp.		x	x	x	x	x	x	x
<i>Cypraea</i> sp.						x		
<i>Pinctada margaritifera</i>							x	
<i>Pinctada</i> sp.						x	x	
<i>Terebra</i> sp.	x			x		x		x
<i>Tridacna</i> sp.	x	x	x	x	x	x	x	x
<i>Trochus</i> sp.						x		

wall features. The complex continues for about 400m in a north-south direction along the ridgeline. The most prominent feature of the central village complex is a wall (F-15) directly opposite the F-5 platform. The wall, located on a naturally steep semi-circular section of ridgeline, consists of neatly stacked small to medium sized boulders positioned to enhance the ridge's natural defenses. The wall is oriented in a rough semi-circle and has a length of around 13m, a maximum wall height of 2m, a width of 2m, and rises 6.5m above the sandy flat.

A second significant feature (F-4) is a modified, 4m in diameter sinkhole, likely a prehistoric well, to the south of the wall (F-15). The well is lined with rounded chunks of limestone and opens to the west. Accumulated in the base of the sinkhole are large quantities of ceramics, shellfish, and shell artifacts.

Further south is one of the most intriguing stonework features. It is an irregularly shaped platform (F-18) constructed of medium-sized coralline limestone blocks that is situated near the middle of the current mangrove swamp. The low platform is 30.0m long, has a maximum width of 16.5m, and is approximately 0.6m above the swamp deposit (**Figure 18**). Located in the intertidal zone, the feature is surrounded by water at high tide. Large quantities of pottery sherds and many small to mid-sized volcanic rocks are scattered on the platform surface. A limestone upright associated with a concentration of volcanic rocks is on the platform's northeast quadrant (**Figure 18**). The feature's function is unclear but it may be related to activity around the tidal channels to the south of the central village (F-22 to F-25).

The features shown in **Figures 16** and **17**, including the large midden deposits to the north, were likely part of a single settlement system. This assumption is supported by the similar ceramic vessels and shell artifact types recovered throughout the area and the walkways/causeways and trails linking the two feature complexes.

Marine shell food remains recovered in the western stonework area of Ikulaul produced a radiocarbon



Figure 18. Dmasech stone work (A) F-18; (B) coral slab and volcanic stones. Photo Clark/Reepmeyer – ANU

date range of AD 1240-1410. Stonework on the nearby sand flats of Beluu Ngemelis reflects a later occupational horizon dated to AD 1530-1770.

Uchularois Island

Uchularois is located off the southeast tip of Dmasech Island (**Figure 19**). It is connected to Dmasech by a low sandbank (tombola), but has been separated from Dmasech in the recent past. Previous work by Osborne (1966) and Masse et al.

(1982) recorded large intertidal midden deposits on the island's west and south sides. Only small eroded remnants of these middens were recorded during the 2010 survey. Degradation of the midden sites is likely a result of storm activity and potentially changes in sea level.

The island is 200m long and has a maximum width of 75m. In contrast to other low lying islands in the Ngemelis Group, Uchularois is a dome-shaped mass of coralline limestone that rises abruptly out of the water. Vegetation is similar to that on Dmasech Island with coconut tree, *Cocos nucifera* (*lius*), the wax apple tree, *Syzygium samarangense* (*rebotel*) on the beach flat and trees such as the screwpine, *Pandanus tectorius* (*ongor*), *Polyscias grandifolia* (*bungaruau*), *Scaevola taccada* (*korrai*), the ironwood tree, *Casuarina equisetifolia* (*ngas*), the fish poison tree, *Barringtonia asiatica* (*bduul*), and vines on the hill slopes.

A large two-story, dilapidated, visitor shelter/dormitory is located on the southwest edge of the island on a small raised beach that is approximately 35m long and 1-2m above sea level (**Figure 20**). The remains of showers, cooking areas, a cistern, and concrete structures associated with the visitor structure are on the beach flat. Masse et al. (1982) noted that construction of these structures in the 1970s had destroyed midden deposits on the beach. The 2010 survey identified further damage to parts of the prehistoric site, with two stone platforms and a stone wall destroyed by modern use. Remnants of one platform (F-3) appear to have been used as a foundation for the water tank.

Several stone features are located on the south side of Uchularois. Most of these are terrace-platforms made to increase the size of natural ledges and provide level areas for habitation. Oral traditions suggest that some of these stone features represent the home village of Uchermelis, the chief of the Ngemelis Complex. Uchermelis later led a migration from Ngemelis to Ngaremlengui in western Babeldaob and established the houses of Ngeremakiar and Mesebeluau (Parmentier 1987:248).

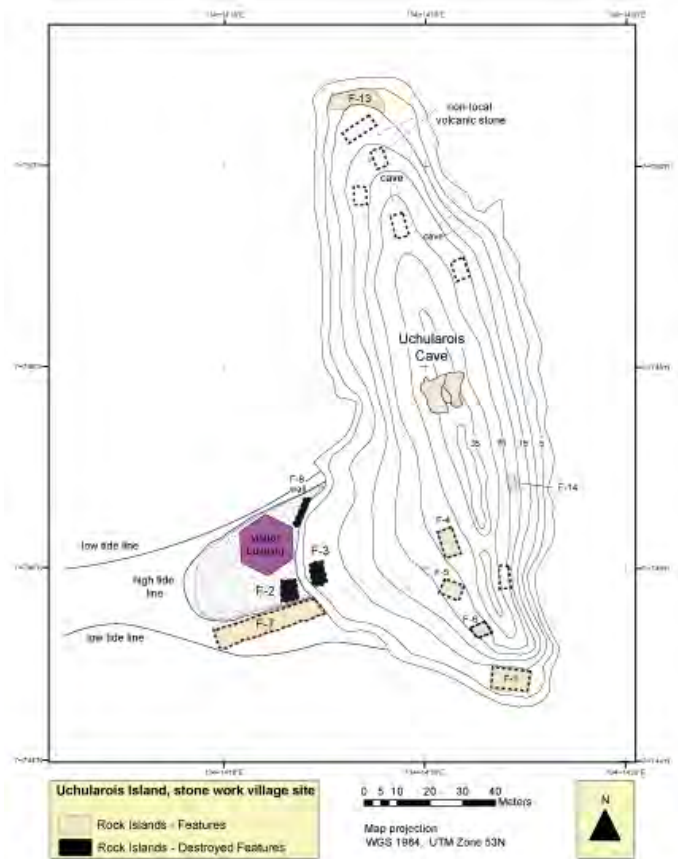


Figure 19. Uchularois Island archaeological sites and tourist facilities. Clark/Reepmeyer – ANU



Figure 20. Uchularois tourist facility (to be removed). Photo Clark/Reepmeyer – ANU

Seven stone platforms and terraces were recorded on Uchularois in 2010. A prominent prehistoric feature is the remnant of a canoe dock (F-7) directly adjacent to the beach flat. The 33m long and 4m wide dock is currently composed of medium to large coralline limestone boulders that

are deeply embedded in intertidal sands. Only the foundation of this substantial structure remains and photographs indicate it was in a similar condition in the early 1980s. Associated with the dock is a platform (F-1) reputed to be that of the chief of Ngemelis. This large feature perches on the lowest raised terrace of Uchularois's southeast edge to overlook the center of the Ngemelis Complex. The 11m long and 7m wide platform is positioned between a limestone outcrop to the south and the cliff face to the north (**Figure 19**).

Uchularois Island received intensive archaeological work by Bruce Masse (1989), who focused on recovering a detailed cultural sequence. Masse investigated a series of inter-connected cave/rock shelters in the center of the island that contain relatively undisturbed subsurface deposits (**Figure 21**). Excavation units were dug in two chambers of the cave complex. The east chamber contained only shallow cultural deposits descending to 30cm below surface. However, the west chamber had stratified deposits to 130cm below surface with cultural material extending to a depth of 215cm. The surrounding sediment was a fine dust with a high organic content which likely accumulated from wind, termite activity, and the roosting debris of bats. The cave units unearthed a rich and diverse array of cultural remains comprising several thousands of artifacts (pottery, shell, stone, and bone tools/ornaments), along with more than 50,000 food shells and 13kg of animal bones (pig, turtle, dolphin and possibly a pilot whale). Two hearth features dated to AD 1250-1450 overlay sediments with prehistoric remains dated to AD 650-1000 (**Appendix C**).

The Uchularois Cave Complex is significant as the only Palauan site whose cultural remains have been studied in the detail sufficient to track human impact on the marine ecosystem through time. Uchularois's rich faunal assemblage includes marine shellfish, fish bones, and the scattered remains of prehistorically introduced animals such as the pig (*Sus* spp.) and rat (*Rattus* spp.). Analysis of shellfish and fish bones demonstrated a significant size decrease in taxa in the late-prehistoric period

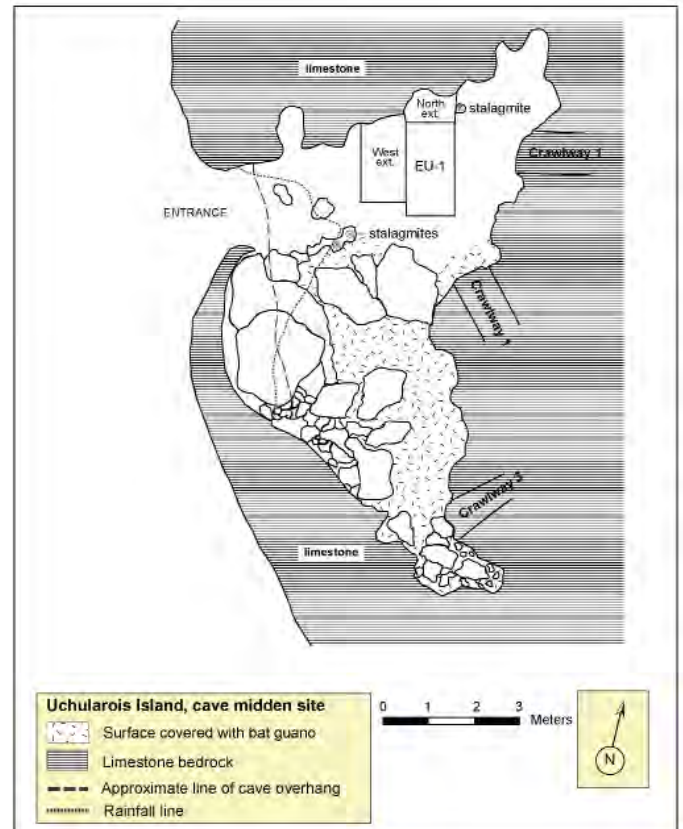


Figure 21. Uchularois Cave and excavations. Clark/Reepmeyer – ANU

prior to island abandonment. The intertidal coral reef shellfish *Strombus gibberulus* declines in size as do the bony mouth parts of several common lagoon fish (Lethrinidae [*Monotaxis grandoculis*], Diodontidae, and Scaridae) (Carucci 1992).

The detailed faunal analysis indicates that over-harvesting of reef resources was taking place as a result of the permanent occupation of Dmasech-Uchularois during the stonework village phase. The evidence for human impact on the lagoon ecosystem coincides with data showing that Palau had a drier climate when the Rock Island stonework villages were occupied (Sachs et al. 2009). The climate study examined sensitive microbiological, isotopic, and molecular indicators of rainfall in sediments collected from Spooky Lake on Mecherchar. The palaeocores indicate that precipitation decreased in Palau from AD 1450-1650 due to the southward movement of the Pacific inter-tropical convergence zone (ITCZ). The impact of drier conditions on the natural environment, especially inshore fish and shellfish, and pelagic fish stocks is uncertain.

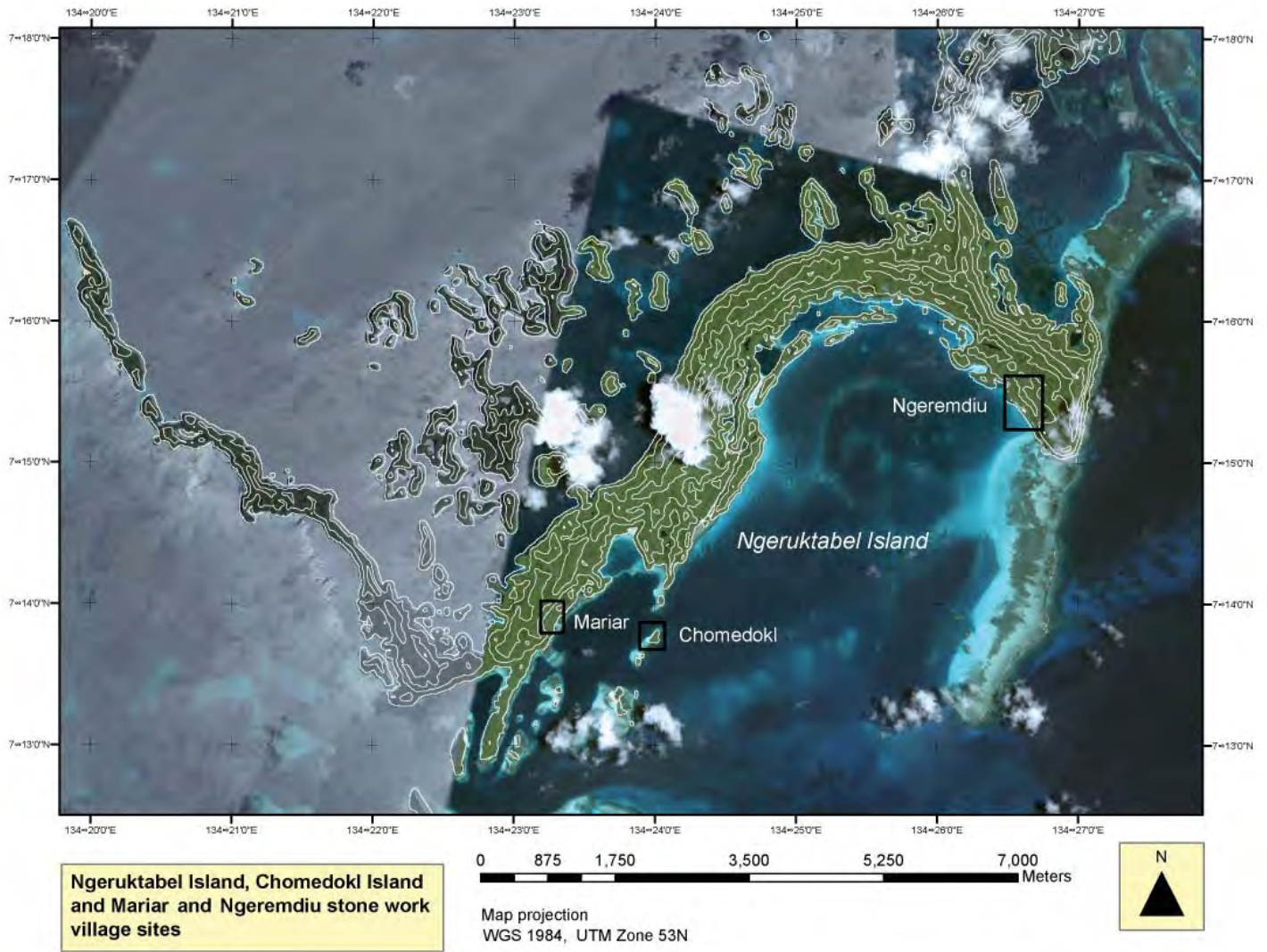


Figure 22. Ngeruktabel Island, Chomedokl Island and Ngeremdiu. Clark/Reepmeyer – ANU

Yet, decreasing precipitation is likely to have been a significant factor in the abandonment of the Rock Island stonework villages, whether through primary loss of potable water, or from secondary effects such as a decline in horticultural yields (both in the Rock Islands and on Babeldaob).

Ngeruktabel Island

Ngeruktabel, the largest Rock Island, was formed by the uplift of Miocene-aged reef fronts which preserve as eroded arcuate ridges and segments

(Figure 22; Table 4). The uplift resulted in an extremely rugged topography that includes 17 marine lakes and abundant sink holes. The island and associated islets hold a large number of cultural sites identified as the remains of several stonework villages, Yapese stone money quarries, rock art, and a significant complex of WWII structures and remains. Only parts of the island have been intensively archaeologically surveyed, and both tour operators and the local population report many sites that are currently unrecorded. The 2010

Table 4. Islands of the Ngeruktabel Complex

Island Complex	Number of islands	Land area (km ²)	Shoreline length (km ²)	Shioya sand (km ²)	Limestone outcrop (km ²)
Ngeruktabel Island/islets	156	18.62	91.55	0.05	18.57

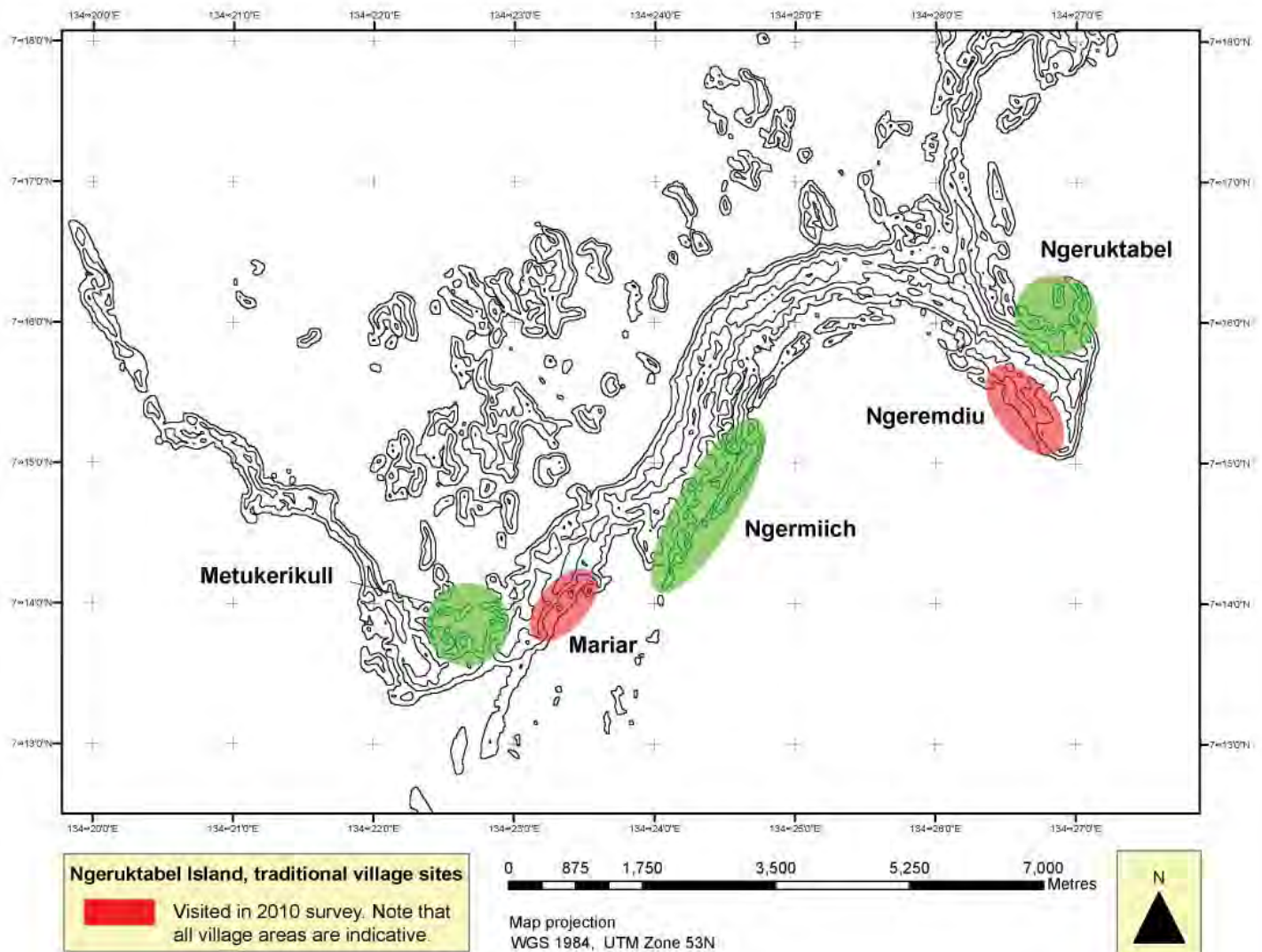


Figure 23. Ngeruktabel Island traditional village sites. Clark/Reepmeyer – ANU

survey examined two stonework villages (Mariar and Ngeremdiu), a Yapese stone money site, and a Japanese WWII defensive complex located on the road to Roisngeremdiu. Previous work involved survey of several stonework villages on the main island and sites on nearby islets (Takayama 1979; Masse et al. 1982; Snyder 1985).

Ngeruktabel like other Rock Islands is uninhabited today. Oral history identifies at least five occupied villages in late prehistoric times: Metukerikull, Mariar, Ngermiich, Ngeremdiu, and Ngeruktabel (Figure 23). The Ngeruktabel population migrated northward to Koror and Babeldaob. Depopulation is recorded as being primarily associated with warfare, although in the case of Ngermiich village, migration is said to have been due to a lack of food. Most of the Ngermiich people moved out suddenly, to

Melekeok then to Ngardmau, leaving behind the first chief and his clan. This chief moved his clan to Ngerkebesang and renamed his clan 'Ngermiich' so that the memory of their homeland on Ngeruktabel would not be forgotten (Snyder 1985:288).

Ngeruktabel's foremost oral history concerns the conflict between Koror and the village of Metukerikull. This warfare had three significant impacts. First, Metukerikull was totally abandoned. Second, after the defeat of Metukerikull, Koror was able to increase its status and position in Palau relative to other villages and districts (*renged*). Finally, there was a significant decrease in Rock Island occupation as those that assisted Koror against Metukerikull were given permission to settle in Oreor because of their special relationship with the High Chiefs *Kloteraol* and *Ibedul*.

Oral History – The taking of Metukeruikull

Several versions of the story of the taking of Metukeruikull specify that villages on Ngeruktabel Island, especially Metukeruikull, were oppressing the then minor ranking village of Koror. Other villages that oppressed Koror were Ngermid, Ngerbechedesau, Ngerekebesang, and villages on Ulong (Nero 1987:125-198). An example of Koror’s oppression is its being banned from fishing in a large area of the RISL.

In return for being allowed to settle on Koror, the chiefs of the Rock Island settlements of Mecherchar, Ngermeaus, Ngchelobel, Beluuchouar, Ngerchong, Ngercheu, Babelomekang, and Ioulomekang assisted Chief Kloterail in overcoming Metukeruikull.

The cause of the conflict was the capture and killing of Chief Ibedulrekereel from Koror by the people of Metukeruikull when he was on a fishing expedition in the southern lagoon. The chief’s arm bearing his dugong vertebra (an insignia of high status and power) was cut off and placed in the bottom of woven basket filled with sweet ground taro (*chelbaki*). The basket of taro was sold to the Koror Council of Chiefs who, upon eating the food and finding Chief Ibedulrekereel’s arm, planned a retaliatory attack on Metukeruikull. To accomplish this, high Chief Kloterail married into Metukeruikull. During the festivities surrounding a ceremonial feast (*mur*) for his new wife, Metukeruikull was easily taken unawares by Koror and its allies. Many of its inhabitants were killed and the village was soon abandoned. The Metukeruikull refugees migrated to Airai and settled at Oikull, which is a contraction of the name Metukeruikull (Nero 1987).

Mariar

Mariar is the Palauan name for two adjacent beach flats on the southeast side of Ngeruktabel Island (Figure 23). The beaches are located about 150m apart and at low tide there is easy access from one to the other. The larger, southern beach is locally referred to as ‘Big Mariar’ (Klou el Mariar) while the smaller, northern beach is called ‘Little Mariar’

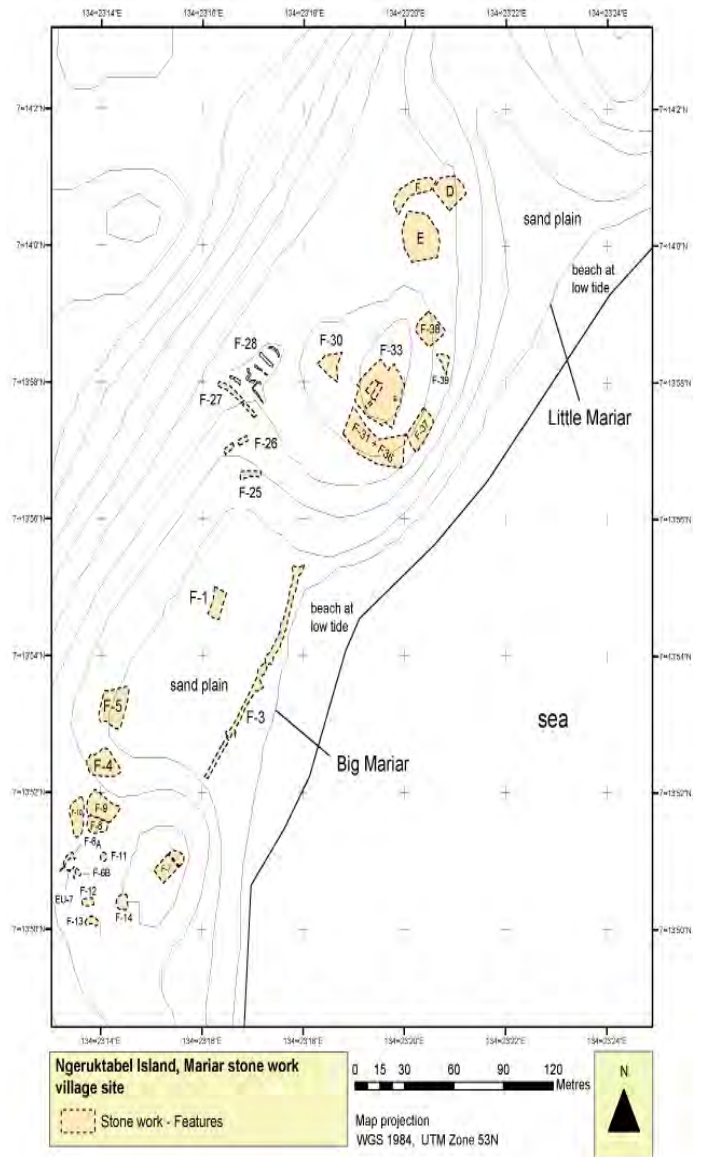


Figure 24. Mariar stone work village. Clark/Reepmeyer – ANU

(Kekerei el Mariar). Both beaches, particularly Little Mariar have been recently used as fishing camps and have domestic structures built on them. Vegetation on the beach flats is dominated by coconut, wax apple (*Eugenia samarengense*), and common strand taxa. Several edible species including banana, papaya, and giant swamp taro are also present.

Oral history asserts that at various times Mariar was allied with, and dominated by, Metukeruikull and Ngeruktabel. The inhabitants of Mariar and Metukeruikull left their villages after the war with Koror and settled in Ngermid in Oreor and Oikull in Airai.

Intensive survey of Mariar (Masse et al. 1982; Masse 1984) recorded some 50 archaeological features on the two beach flats and surrounding slopes and ridges (**Figure 24**). Two limestone hilltops overlooking the beach to the south and north of Big Mariar support extensive stone features. On the hilltops are well-preserved terraces made of small-to-medium sized limestone blocks to the south (F-4 to F10) and on the slopes to the north of Big Mariar are two defensive walls (F-26 and F-27 complex (**Figure 25**).

The south hilltop contains a large, well-constructed stone platform that measures 12m by 7m (F-7). Associated with the platform were two volcanic rocks (one has been removed) and a small limestone upright set carefully into a base of packed limestone rubble (**Figure 26**). Feature 7 is notable because sites associated with religious/magical activity were frequently located on high points in the Palauan landscape (Krämer 1917:237-238)

The north hilltop has a large, irregularly shaped area of stonework (F-33 complex) consisting of a well-constructed outer wall encompassing an area of 26-28m² (**Figure 27**). Several unusual stone features lie inside this area, including an alignment of limestone boulders (F-33D) and two parallel platforms

standing 50-75cm above surface that surround a central oblong depression (F-33A-C). The purpose of these structures is currently unclear. Radiocarbon dates associated with Mariar's features range from AD 1530-1730 on the southern hilltop's platform (F-7) to AD 990-1100 on a midden deposit on the Big Mariar beach (**Appendix C**).

The prominent feature on the Big Mariar beach is a long defensive wall extending the length of the sandy plain. The wall was recorded in the 1980s as being 110m long, 2m wide, and 2m high. Since then, the feature has progressively deteriorated by tree growth damage and stones removed to make fireplaces and provide easier inland access (**Figure 28**). Several rock piles and stone alignments (likely the remains of prehistoric platforms and walls) recorded in the 1980s by Masse et al. (1982) are currently so disturbed they are no longer identifiable as coherent structures. Any potential, associated subsurface cultural deposits may remain intact.

Of concern is the disappearance of the majority of the stone features that were recorded at Little Mariar in the 1980s. The large wall near the front of the beach is entirely destroyed from the combined effects of wave action and tree damage. Large strandline taxa such as *Calophyllum inophyllum*

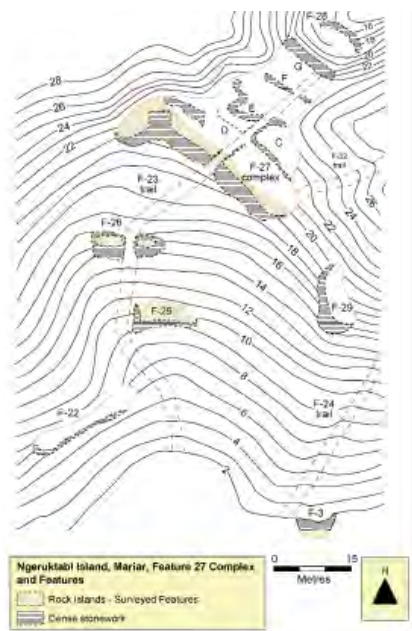


Figure 25. Mariar F-27 complex. Clark/Reepmeyer - ANU

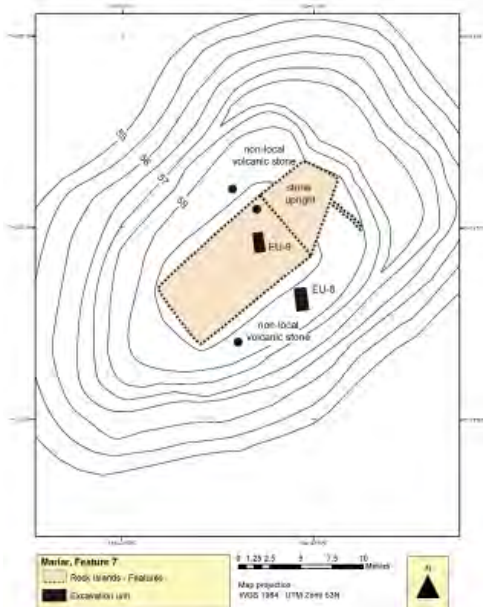


Figure 26. Mariar F-7 platform. Clark/Reepmeyer - ANU

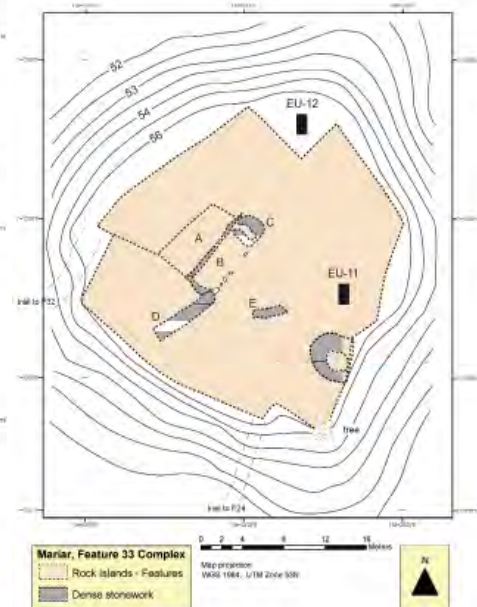


Figure 27. Mariar F-33 complex. Clark/Reepmeyer - ANU



Figure 28. Big Mariar defensive wall in the 1970s. Top photo by Bruce Masse. Bottom, Clark/Reepmeyer – ANU

(*btaches*) grew on the wall; when their roots are undermined by storm waves and collapse the stonework is deposited on the steep beach and removed by subsequent wave action. Human activity has also negatively impacted the ancient stonework. In 2010, a wooden shelter stood in the center of the beach. Its associated cooking area was constructed from limestone blocks that were probably taken from one of the prehistoric structures recorded in the 1980s.

Overall, the preservation of stone features on both beach flats was poor compared to the more intact structural remains located on limestone slopes and ridges. With the exception of Ulong, this pattern of variable preservation was also noted at other Rock Islands. At Ulong the preservation of cultural remains on the beach flat has been favored by their distance from the sea and the placement of the visitor area some 200m north of the stonework village.

Ngeremdiu

Ngeremdiu is a stonework village system on the southeast tip of Ngeruktabel Island. The village complex connects two beaches: Oimaderuul and a large cove 250m to the north (**Figure 29**). The beach flats and limestone slopes had been archaeologically surveyed (Osborne 1966; Masse et al. 1982; Snyder 1985) prior to the 2010 work when additional prehistoric features were recorded. Currently, the central part of the beach flat has a visitor structure and composting toilet block, with signage for the re-constructed prehistoric well north of Oimaderuul (close to F-9).

Traditional history tells that after the people of Ngeremdiu were attacked by a giant centipede they decided to leave their home and move to Babeldaob. The first chief, Secharuleong, and second chief, Tmekei, split the villagers into two groups. Chief Secharuleong's group migrated to the west coast of Babeldaob, settling near Medorm village in Aimeliik. They established their *bai* at Ngeruudes hill and named it Bai Melekeok. Their god house was named after the village structures on Ngeremdiu. Chief Tmekei led his group to Ngerang on the east coast of Babeldaob and named the village 'Melekeok' after their part of Ngeremdiu village.

Ngeremdiu's stone features are located to the north of the 200m long and up to 75m wide Oimaderuul beach. Oimaderuul has a low density surface scatter of pot sherds and food shells. Substantial stonework is found along a low saddle to the north (**Figure 29**), and in adjacent limestone terrain including a low saddle south of the beach near the marine lake (Shrimp Lake, 4000m²). It is likely that all the prehistoric features are part of a single dispersed village occupation. Further survey is required, particularly in the north, to identify the extent of prehistoric occupation.

The remnant of a defensive wall (F-9) fronted by a large 16m by 4m stone platform (F-10) lies to the north of Oimaderuul. The wall controls access to a large taro swamp that contains a recently refurbished prehistoric well. The 2010 survey noted

of limestone boulders (**Figure 31**). Overlooking the path and stone walls is a large 23m by 15m stone platform (F-1). It appears that many of the gullies and limestone ridges north of Oimaderuul contain prehistoric stonework.

An extensive set of stone features recorded by Snyder (1985) as on the ridgeline southeast of Oimaderuul could not be identified in 2010. Several terraces and stone platforms were found only on the south slopes and ridgetops (F-100 to F-105, and F-28, F-37, F-38 in Snyder 1985). These features were disturbed during construction of an extensive WWII Japanese defensive complex, which covers the ridge face overlooking the beach. Defensive positions include foxholes dug into the limestone ridge and circular/sub-circular stone walls that were likely defended gun emplacements. The ridge appears to have been attacked in WWII, and Snyder reported intact shells and bombs littering the surface. Large stone platforms and walls are present around a sinkhole south of Shrimp Lake. These features were associated with midden material consisting of pottery sherds, shell artifacts, and food shells. No midden deposits were located on the south slope of the marine lake although there is a sparse scatter of traditional pottery sherds. Midden deposits were recorded by Snyder (1985) in several sink holes in the vicinity of the marine lake and in a number of caves/rock shelters. The complex of features in the Ngeremdiu area is a good example of the dispersed prehistoric settlement pattern found in the Rock Islands.

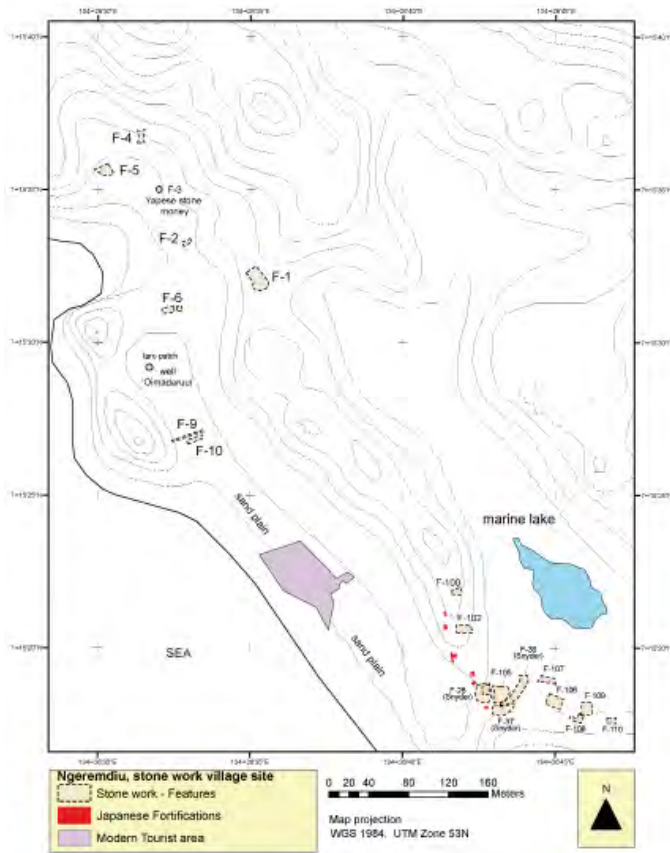


Figure 29. Ngeremdiu stone work and Japanese WWII features. Clark/Reepmeyer – ANU



Figure 30. Oimaderuul Beach refurbished stone well. Photo Clark/Reepmeyer – ANU

probable prehistoric stonework below the well's water table (**Figure 30**).

Separating Oimaderuul from the northern beach is a low saddle with a defensive stone wall (F-6). Additional stone features to the north and east were also observed. Stone walls and terraces (F-2, F-4, F-5) line the well-preserved path through the limestone off of the northern beach (**Figure 29**). Also recorded was an unfinished piece of Yapese stone money (F-3) that measures 83cm in diameter and 18cm thick. It is placed upright against a stack

Ngeanges Island

Ngeanges is a small island situated about a 1000m south of Ngeruktabel Island. Roughly 30m high limestone outcrops dominate the north and south ends of the island (**Figure 32; Table 5**). A limestone pinnacle lies between the two outcrops. These outcrops are connected by a raised beach of Shioya sand. Vegetation is similar to that on Dmasech and Uchularois Islands. Evidence of recent occupation and use of a visitor shelter and long drop toilet, both in poor condition included piles of rubbish and used building materials. The island is known as a cooking place where families can camp to take advantage of seasonal marine resources.



Figure 31. Ngeremdiu Yapese stone money (F-3).
Photo Clark/Reepmeyer – ANU

As oral history links Ngeanges with the village of Metukeruikull on Ngeruktabel Island as well as with Mecherchar, it may have altered its affiliation during the course of prehistoric occupation. Stonework on the southern limestone outcrop is reputed to be the house of Aderdei, a chief of Ngeanges. After the war between Koror and Metukeruikull, and the depopulation of Ngeruktabel, Aderdei continued to live on Ngeanges before being induced to relocate to Oikull by the offer of two taro patches (Osborne 1966:437-438).

The beach flat in front of the two limestone outcrops contains substantial prehistoric midden remains that have been partially reworked by land crabs. Other disturbance agents include the effects of WWII bombing and megapode activity. Excavation encountered a midden deposit composed of pottery fragments, shell and stone artifacts, and food shell extending to a depth of 60cm depth (Masse et al. 1982). Radiocarbon dates indicate midden formation and village occupation at AD 1350-1500.

Several stone platforms, terraces, and other features are on the slopes and higher parts of the southern limestone outcrop (Figure 33, F-1 to F-20). As noted at several other prehistoric village sites on coastal flats, stone platforms on the beach were scarce and poorly preserved. There is a possible Yapese stone money quarry (F-17), and similar to Ngeremdiu, there were several Japanese defensive positions mingling with the prehistoric Palauan

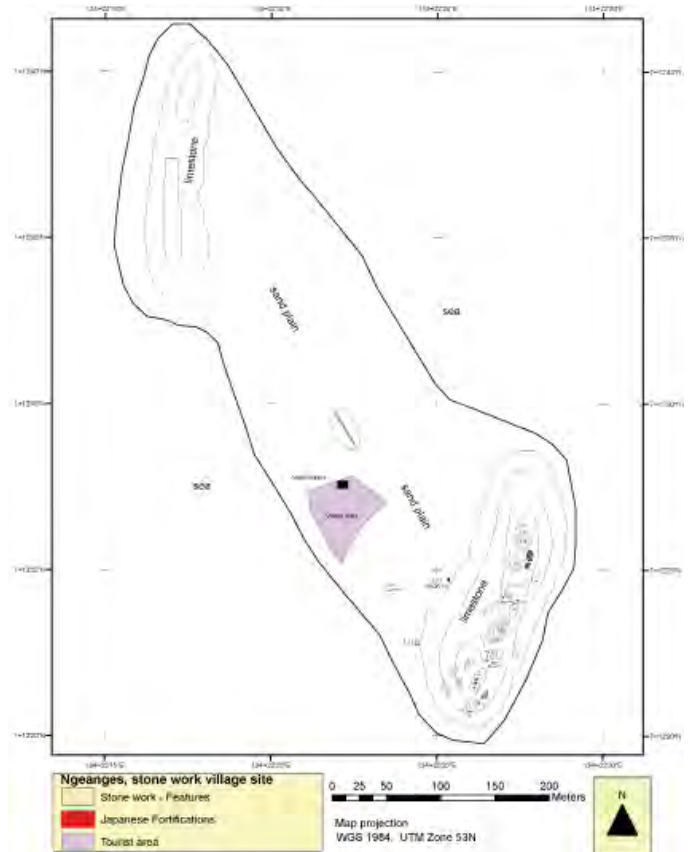


Figure 32. Ngeanges Island archaeological sites and tourist facilities.
Clark/Reepmeyer – ANU

stonework (F-14, F-16, and F-18). Preservation of stone features in the limestone and the midden deposits on the beach appear to have been affected by WWII bombing/shelling. Several bomb fragments were found in excavation units and a large bomb crater was recorded on the beach flat.

Chomedokl Island

Caves, hollows, benches and solution features are common in Palau's raised limestone islands, and many were used in prehistory for human burial sites. In the Rock Islands, at least 10 burial caves are archaeologically documented with several of these containing the remains of multiple individuals (Fitzpatrick and Nelson 2008; Fitzpatrick et al. 2008). WWII activity and tourist visits have damaged skeletal material and associated artifacts in many of these grave sites. In 2009 and 2010, the large cave on the island of Chomedokl (Figure 34) was visited briefly to record GPS points. Berger et al. (2008) conducted a brief survey of Chomedokl's burials. Traditional history records the cave as the burial place for the child of the *Rubak Reklai*

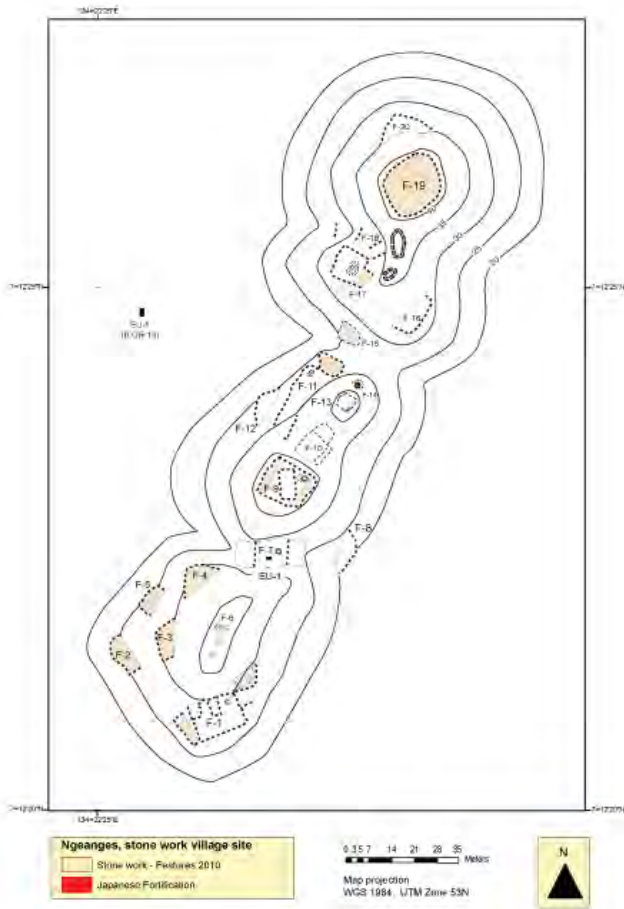


Figure 33. Ngeanges stone work features on southern outcrop. Clark/Reepmeyer – ANU

(Osborne 1966:436) and skeletal remains from adolescents have been tentatively identified.

The about 8m wide cave entrance in the north of the island is fronted by small islet and a narrow intertidal coral boulder area. A shelf of cemented limestone/beach rubble lies 1-1.5m above the beach base (Figure 35). Access to the cave is dependent on tide position and wave strength. The cave's entrance is defined by an approximately 45m long, southwest oriented, high chamber. The surface of the entrance chamber is covered in limestone rubble and calcareous sediment with occasional large roof fall boulders. The concentrated areas of fragmented human bone lying in the passage were marked during Berger et al's (2008) visit with flag tape attached to thin wire pegs.

Table 5. Ngeanges Island

Island Complex	Number of islands	Land area (km ²)	Shoreline length (km ²)	Shioya sand (km ²)	Limestone outcrop (km ²)
Ngeanges	1	0.117	1.67	0.06	0.07

The map made by Berger et al. (2008) shows that the main chamber opens out to a large southern chamber about 47m in length and 20m in width (Figure 36). The northern end of this latter chamber contains a deposit of sand backed by flowstone, which is likely to have been deposited during the mid-Holocene when sea level was 1.5-1.8m higher than today. The south end of the chamber contains areas of rock fall and skeletal remains including a complete human skull that is cemented into the flowstone. Burial goods found in the cave include a pottery 'plate' and a painted pottery bowl and lid containing stone adzes and shell items (Osborne 196:436, Figure 14). Radiocarbon dates on human bone recovered from the southern chamber and the south end of the entrance passage range from 200 BC to AD 900 indicating that the practice of Rock Island cave burial has a lengthy history.

2.b History and Development of the RISL

The first Europeans to visit Palau noted that all of the limestone Rock Islands south of Malakal and north of Peleliu were uninhabited. Palauan people reported, however, that a population numbering in the thousands had lived in the RISL and traces of their abandoned village sites could be found on many islands. Myths frequently place the origin of social groups and the invention of customary practices in the southern part of Palau, known as the 'lower sea' or *eou el daob*, an area that also includes the islands of Peleliu and Angaur. The origin stories trace the migration of individuals, families, and entire villages from the Rock Islands to contemporary villages on Babeldaob, Oreor, and Ngerekebesang. The immigrants brought village names, chiefly titles, and community deities from their original village site.

Investigation of Rock Island cultural sites began in the Japanese era with the collection of ceramics

and artifacts found in limestone caves. The first systematic survey and excavation of prehistoric sites in Palau was made by Douglas Osborne in 1953-1954 and 1968-1969. Osborne (1966, 1979) recorded Rock Island rock art, ceramics, artifacts, and burial caves. He identified several ancient village sites comprising stonework features (such as walls, platforms, wells, and trails) associated with extensive deposits of marine food remains and he collected the oral traditions associated with the major sites. Osborne's broad overview of prehistoric remains directed subsequent fieldwork with stonework village sites on Ulebsechel and Ngeruktabel Islands investigated by Takayama (1979). At the request of Koror's Council of Chiefs, staff and PhD students from the Southern Illinois University (SIU) conducted extensive archaeological work on those Rock Island village sites chosen by the chiefs (Masse et al. 1982; Masse 1984). At the same time, Nero (1987) facilitated the chiefly council in collecting Koror's oral histories and place



Figure 35. Chomedokl north cave entrance. Photo Clark/Reepmeyer – ANU

names. Many of the documented legends and stories involve cultural properties in the RISL.

The SIU team mapped stonework village sites, obtained radiocarbon dates to estimate the age of village occupation and abandonment, and made detailed analyses of recovered fauna and ceramics (Masse 1989; Snyder 1989; Carucci

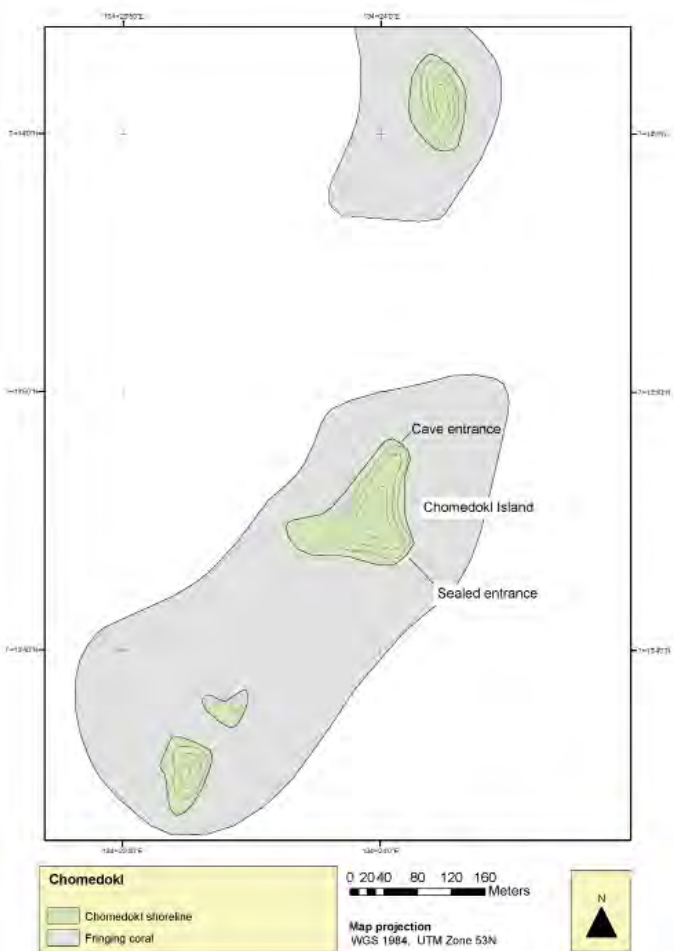


Figure 34. Chomedokl Island burial cave. Clark/Reepmeyer – ANU

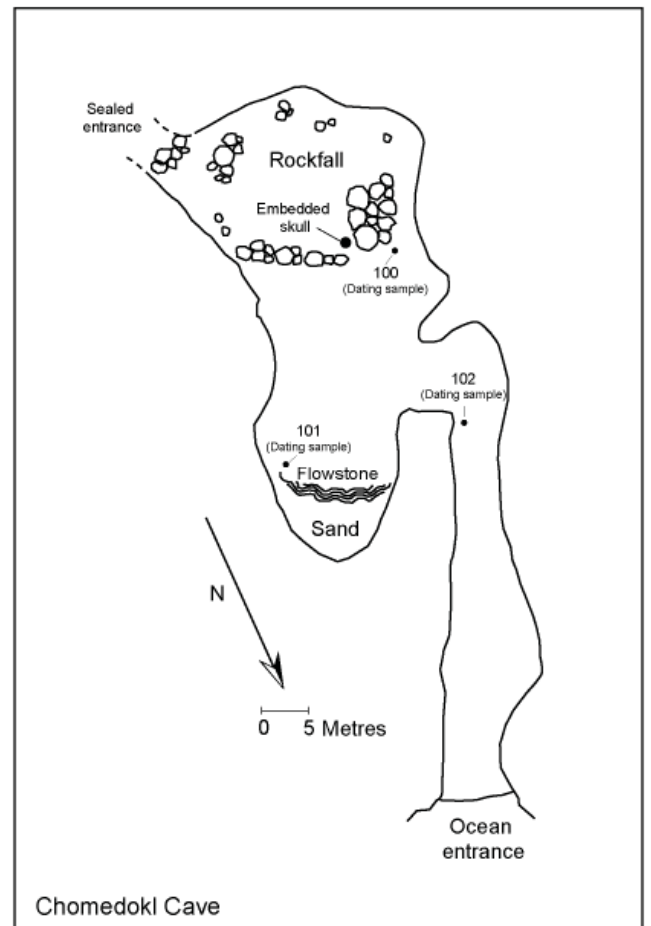


Figure 36. Chomedokl cave plan. Clark/Reepmeyer – ANU

1992). Of significance was the discovery of a local village settlement pattern within a larger regional settlement system. Within the system a dominant village, headed by a paramount chief, is connected to lower ranked villages to form political districts or federations. The radiometric dates show that Rock Island villages were occupied by at least AD 1200 and abandoned by AD 1650-1750. A decrease in the size of shellfish and fish taxa during the course of Rock Island village occupation indicated overharvesting of locally available marine resources.

At the conclusion of the SIU investigations, the antiquity of human occupation in Palau was thought to date to 2000 years ago. Subsequent projects on human burials and cultural deposits on the Rock Islands of Chelechol ra Orrak Island and Ulong have lengthened Palauan history to over 3000 years (Fitzpatrick 2003a,b,c; Clark 2005; Liston 2005), temporally similar to the Neolithic expansion of early ceramic cultures in Island South East Asia and the Western Pacific. The recommendations for human evolution site nominations established at

Burgos, Spain (http://whc.unesco.org/documents/publi_wh_papers_29_en.pdf) noted: *“In later stages of human development, evidence for mobility and technology linked to pulses of colonization and territorial expansion and contraction are important in the broader context of human evolution”*, and noted that human evolution nominations in Asia and the Pacific include feasible sites relevant to: *“Early marine navigation of early and modern human dispersals”*. The 2007 Cultural Landscapes of the Pacific Islands Thematic Study by Smith and Jones (<http://whc.unesco.org/uploads/news/documents/news-437-1.pdf>) also emphasized the importance of early human arrival: *“The story of the colonization of the Pacific Islands is central to understanding the cultural landscapes of the region.”*

The earliest human arrival in Palau is dated to around 3100 years ago from midden remains and mineral-tempered ceramics on Ulong Island with slightly more recent radiocarbon ages on human remains from Orrak Island and Chomedokl Island (Clark 2010). The archaeological remains on Ulong



Stone platform above the Ulong village site. Photo by Ron Leidich.

"It is a curious fact which derives from countless stories and traditions that in former times the high lime rocks in the south have been settled, but are now uninhabited"

(Krämer 1919:5)

represent short term camps and slightly older sites may exist on volcanic Babeldaob where erosion and expansion of coastal mangroves has made it difficult to locate early archaeological deposits. In contrast to the acidic soils on Palau's volcanic islands the chemically stable calcareous sediments of the RISL preserve cultural remains including the oldest deposits relating to human activity in Palau.

Comparison of the early Ulong pottery from the RISL with the oldest ceramics from the Mariana Islands, Yap and Lapita assemblages does not show a close stylistic connection (Clark 2005) between the assemblages and this matches the findings of historical linguistics which indicate that: *The history of Palauan and Chamorro [Marianas] languages differs markedly from that of other An [Austronesian] languages in Micronesia, and from one another. Each appears to have arisen through separate migrations out of insular Southeast Asia*" (Blust 2000:83). The separate migrations responsible for the occupation of Western Micronesia and Palau at 3400-3100 years ago contrast with the well-known Neolithic dispersal of Lapita culture in the Pacific which occurred around the same time (~3350 years ago): *"Nowhere else in the world has the initial settlement of so vast an area been identified by such a clear archaeological signature nor has it taken place so swiftly."* (Smith and Jones 2007:23).

The difference between the independent episodes of open-ocean voyaging to single island groups in Western Micronesia and the vast spread of archipelagoes colonized by the Lapita cultural complex (Bismarck Archipelago to Samoa) is significant as it throws light on the pattern of

Neolithic expansion from southern China to Taiwan and through Island Southeast Asia and into the Pacific. This great dispersal is seen today in the wide distribution of Malayo-Polynesian and Austronesian languages that are today spoken by more than 250 million people and is witnessed archaeologically by red-slipped ceramics, unibeveled adzes, domestic crops and animals, including the domestic pig and chicken (Hung 2008). As in other parts of the world, particularly Europe, the nature of Neolithic expansion is a major topic with debate about the significance of human migration and whether population intrusion and replacement was the dominant mode of expansion, the cultural and biological contribution of local populations to Neolithic life ways and cultural development, and the significance to dispersal of a Neolithic subsistence package to (Sokal et al. 1991; Cavalli-Sforza 2002; Bellwood and Diamond 2005). Similar debates play out in relation to the nature of the Neolithic in Island Southeast Asia and the Pacific (Oppenheimer 2004; Szabó and O'Connor 2004; Bellwood and Diamond 2005; Hung 2008). The early human history of Palau and Western Micronesia is important as it connects with the major transformative events taking place in the Neolithic of Island Southeast Asia 4000-3000 years ago (Craib 1999; Clark et al. 2010).

Maritime technology at this time likely involved a basic single-outrigger canoe made from a dugout log with raised sides made by lashed-on planks, a steering oar, and a simple sail to travel downwind using the northwesterly monsoon which is active from November to April (Irwin 2010). As Neolithic groups moved through the Philippines and into

eastern Indonesia mixing between migrants and indigenous hunter-gatherers created new cultural entities (Bellwood and Diamond 2005). After several centuries canoe voyaging technology and navigation were widely dispersed in the region with the eastern landmasses of Island Southeast Asia from the Philippines to southern Indonesia occupied by Neolithic groups who had by then developed culturally specific languages/dialects and material culture/subsistence innovations. Cultural innovations were affected by the size of migrant groups and their connection with parent settlements, degree of mixing with resident populations, suitability of local environments to sustain different kinds of horticulture, raise domestic animals and provide economic resources necessary to produce items such as fine-grained stone tools, sand-tempered pottery, and voyaging canoes.

The archaeological evidence from early sites in the Rock Islands of Palau and the Marianas Islands

suggests that colonization voyages originated from different parts of an already diversified Island Southeast Asian Neolithic (Clark et al. 2010). The oldest pottery and language of Palau is unlike that of the Marianas and the colonization of the Marianas appears anomalous as its islands were the first in Remote Oceania to be inhabited ~3400 years ago, but colonization required an open ocean passage of ~2000 km, which is much longer than any Neolithic voyage in the world at that time (Craib 1999). The colonization of Western Micronesia by distinct groups who lacked domestic animals such as the pig, dog and commensal rats (e.g., *Rattus exulans*, *Rattus tanezumi*), and the restriction of the colonizing populations to a single archipelago indicates that these were small-scale, potentially involuntary, migrations that were unlike the sustained expansion of the Lapita culture which spread through the sparsely populated/unpopulated archipelagoes of the West and Central Pacific with the human dispersal rate increasing through time (Fort 2003; Clark and Anderson 2009).



Stone money. Photo by Ron Leidich.

Evidence for the oldest human occupation of Palau is present in the RISL and demonstrates the complicated nature of prehistoric expansion, particularly the generation of cultural and linguistic diversity within the major branch of Neolithic dispersal in Island Southeast Asia. The early archaeological record is relevant, therefore, to the theme of *Early marine navigation of early and modern human dispersals* as follows:

- The oldest human dispersal to Palau involved a significant ocean voyage of more than 800 km from Island Southeast Asia/northern New Guinea;
- The earliest archaeological remains from the RISL in Palau preserve the intact cultural signature of an Neolithic group in Island Southeast Asia/New Guinea
- The variation among the oldest archaeological assemblages from Palau and other parts of Western Micronesia and the West Pacific is important as it demonstrates that there were different modes of Neolithic expansion involving culturally distinct groups rather than a single Neolithic population with a homogeneous material culture and subsistence approach.

The past decade has witnessed a renewal of archaeological work on the Rock Islands. Recent investigations of Rock Island cultural sites examine the role of climate change and overharvesting of marine resources on the abandonment of stonework settlements (Masse et al. 2006; Fitzpatrick and Donaldson 2007; Rintaro and Clark In press). Rock Island calcite deposits were mined by Yapese people who voyaged to Palau to quarry huge stone discs and then returned the discs, used as money, to Yap. Several quarry sites have been investigated to examine how the stone money was extracted and the nature of culture contact between Yap and Palau (Fitzpatrick 2003c). Two stone money quarry sites in Airai State, Uet el Daob ma Uet el Beluu and Chelechol ra Orrak, were placed on the tentative World Heritage list on 28/08/2004 (<http://whc.unesco.org/en/tentativelists/1932/>). Culture contact has also been examined in an investigation of the camp of the surviving crew members of the *Antelope*

wreck on Ulong Island where the first contact between Palau and the West took place in AD 1783 (Keate 1789; Clark 2007; Clark and de Biran 2010). Other recent research includes a study of prehistoric human remains from Chomedokl Island which suggested that early Palauans were insular dwarfs (Berger et al. 2008). This controversial finding has been refuted (Fitzpatrick et al. 2008).

In 2010 Koror State passed K9-122-10, prohibiting all construction in the Rocks Islands of the RISL, excepting those improvements made by the Koror State Government itself. This law and the economic importance of the RISL as a tourism destination protect the Rock Island's cultural properties from negative impacts associated with development. Due to the urgency of documenting archaeological sites on the developing island of Babeldaob before they are potentially lost to construction efforts, the Palau Bureau of Arts and Culture annual archaeological survey has not focused on the Rock Islands. This, in addition to the rugged terrain and large number of Rock Island sites (n=c. 300) has prohibited complete archaeological survey, and many additional Southern Lagoon pre-Contact sites, including stonework villages, Yapese money quarries, burial caves, rock art, and early cultural deposits are yet to be documented. Despite the lack of a thorough inventory of RISL cultural properties, previous archaeological investigations have identified the entire temporal scope of occupation and the complete range of RISL site types. Furthermore, the richness of the Rock Island oral histories ensures that all the stonework villages are known, even if they have yet to be scientifically recorded.

Archaeological and historical data divides the Rock Island culture sequence into five phases each associated with distinct artifactual remains, human behaviors, and set of environmental interactions (**Figure 37**).

Phase 1: 3100-2700 years ago

Colonization and mobile encampment

The first evidence for human activity in the Rock Islands dates to 3100 years ago on Ulong Island. At this time, sea level was declining after being 1.5-1.8m higher than it is today. Subsidence of

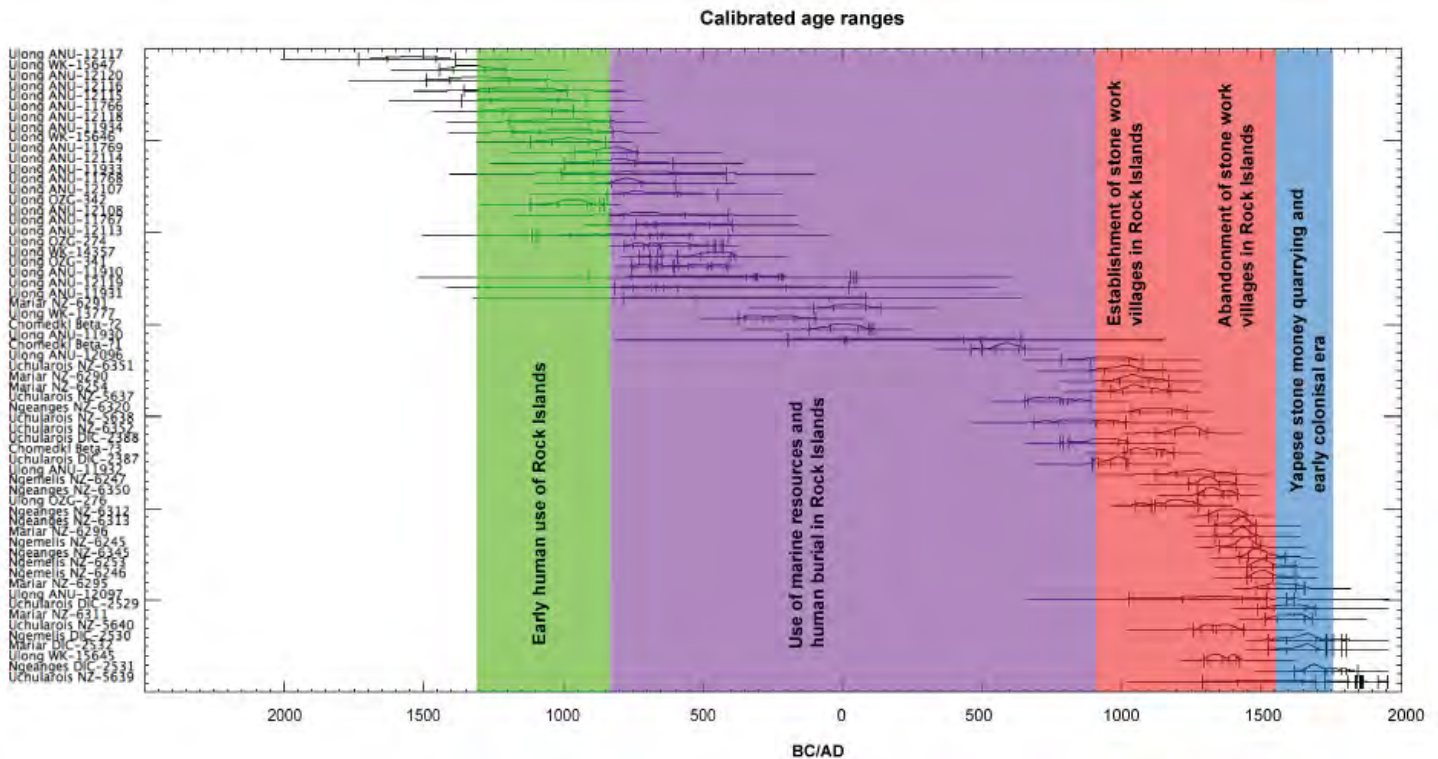


Figure 37. Rock Island radiocarbon dates and cultural phases. Photo Clark/Reepmeyer – ANU

the Palau archipelago (estimated at 0.6mm/year) ensured that there were relatively few beaches and landing spots suitable for gaining easy access to the Rock Islands. Ceramic vessels consist of medium-sized, red-slipped jars made with a mineral temper that was collected from the nearby volcanic islands. Marine resource use focused on the collection of large locally available clams (*Tridacnidae*) and inshore fish species. Rock Island occupation was short-term and consistent with the presence of mobile camps that skimmed pristine stocks of marine foods from accessible locations.

Phase II: 2700-1000 years ago

Human burials and rock art

Caves and shelters in the Rock Islands were consistently used for human burials for almost 2000 years. The burials are occasionally accompanied by grave goods such as shallow bowls/dishes (grog tempered) decorated with a red slip or paint, shell items such as personal ornaments and pearl shell knives/scrapers, stone adzes, and painted stones. Smaller caves appear to have been used for individual interment while many of the larger caves contain multiple sets of human remains. These latter sites were likely cemeteries for groups who

occupied the volcanic islands and had rights to the Rock Islands. Territorial rights are also represented in the placement of rare, highly visible rock art in two exposed locations (Ulong Island; Olechukl overhang and associated caves: Ngeruktabel; Taberrakl, cliff), although some art was, like human burials, hidden from view in limestone caves (Ulong Island; associated caves). As limestone often rapidly weathers in a tropical climate, many of the Rock Island's art sites have been lost through erosion. The most spectacular remaining site is on Ulong Island where there is a large gallery of red painted art.

Continued use of the Rock Island marine resources is indicated during this phase. However, the lack of evidence for permanent settlements suggests that the technological and social adaptations necessary for occupying harsh limestone landscapes had yet to develop.

Phase III: 1000-350 years ago

Village settlement and intensified use of marine resources

Permanent villages were first established in the Rock Islands about AD 1200. Behind the larger sand plains, trails criss-crossed the rugged limestone

environs to connect stone terraces, platforms, and walls. Settlement location was strongly defensive with high stone walls—some built with an interior foot ledge to allow defenders to hurl projectiles onto attackers—extending across those beaches that provided canoe access. Defensive walls were also strategically placed across trails connecting a village's coastal and interior zones. Large and/or elaborate platforms and stonework consistent with social stratification and site specialization were built on high limestone points and ridges. Traditions record that stone structures on high points were either a chiefly residence, or were the abode of priests. As indicated by substantial midden remains and house platforms, domestic space was generally on sandy beaches. Burials were in sand plains, often in areas with stone structures, although cave burial may also have continued to be practiced. Giant swamp taro (*Cyrtosperma merkusii*) was grown in the swampy ground at the interface between the limestone bedrock and the coastal plain and damp sink holes, while tree crops such as coconut (*Cocos nucifera*) were grown on sandy beaches.

The overwhelming components of prehistoric village deposits are marine shells and pottery fragments. Ceramics, large flanged-rim bowls made with a crushed pottery temper, were produced on the volcanic islands and transported to Rock Island settlements in large quantities. Domestic artifacts were largely fashioned from marine shell. Large clams, collected from the outer reefs, were used to make adzes, pounders, and other utensils. The subsistence economy relied on shellfish and finfish. Food shell mostly derives from small taxa, particularly *Strombus*. The diversity and abundance of fish taxa increases in this phase with the capture of pelagic species such as tuna (Scombridae) and mackerel sharks (Lamnidae). During the course of Rock Island village occupation the size of several subsistence taxa decreases as a result of over-harvesting. With the total Rock Island population estimated to have been between 4000 and 6000 during this temporal phase (Masse et al. 2006), the environmental impact of human occupation on the RISL's terrestrial and marine environments must have been substantial.

Phase IV: 350-100 years ago

Village abandonment and Yapese stone money quarrying

The Rock Islands were depopulated over several centuries with relocation of groups north to the volcanic island of Babeldaob and south to the large platform limestone islands of Peleliu and Angaur. The Rock Island settlements were economically unsustainable in the face of a drying climate, a growing population, and a decline in the abundance of marine foods. The tenuous economic conditions of those occupying the limestone islands are exemplified in their dependence on pottery cooking and storage containers that were only produced on volcanic islands. Abandonment of the Rock Islands had significant socio-political consequences for Palau as village groups were incorporated into larger and more powerful structures, particularly in Koror.

The abandonment of the Rock Islands was followed by significant interaction with Yapese voyagers who were drawn to Palau to quarry the limestone island's calcite deposits to make stone disk money. Stone money was valued according to its shape, weight, color, and the effort expended in its quarry and transport. In Yap, the large disk money, displayed along the front of stone residential platforms, signaled the status, power and prestige of the individual and clan (Fitzpatrick 2003c). Yapese relations with Palau were influenced by the competition between the rival polities of Koror and Melekeok with Yap's Gagil village linked to Melekeok and Rull associated with Koror (Morgan 1988).

During Phase IV, the RISL's terrestrial and lagoon environments would have experienced some rejuvenation with expansion of indigenous forest on limestone islands and less intensive collection of coral reef species.

Phase V: 230-65 years ago

Colonial era and WWII effects on the Rock Islands

In 1783, the East India packet, the *Antelope* was shipwrecked on Palau's western barrier reef. Upon the crew's return to England, the account of the newly 'discovered' Palauan people (first published

in 1788) became, after James Cook's volumes, the most popular voyaging book of the late 18th century. During their stay, the *Antelope's* crew assisted the paramount chief of Koror, the Ibedul, to overcome his enemies on Babeldaob and Peleliu. The favorable relations between the Ibedul and foreigners in subsequent years were detrimental to Koror becoming Palau's central place, albeit under successive colonial administrations (Spain 1885-1889, Germany 1889-1914, Japan 1914-1945, United States 1945-1994).

From a landscape perspective, World War II (in Palau largely restricted to Japanese and U.S. forces) had a huge influence on the Rock Islands. The Japanese military caused impacts resulting from activities of garrisoning troops such as concealing caches of military supplies, establishing defensive positions, and mooring naval and supply ships. Remains from the global conflict include shrapnel fragments, abandoned equipment, unexploded ordnance, gun emplacements, troop shelters, sunken ships and planes (Bailey 1991). Japanese soldiers built many earth and stone defensive features in Palauan stonework villages and numerous caves and rock shelters were cleared of prehistoric remains or otherwise affected by military activity. The

defeat of the Japanese in World War II led to the administration of Palau being transferred to the United States as part of the Trust Territory of the Pacific.

Phase VI: Modern Conservation History

The Ngerukewid Islands Wildlife Preserve was established in 1956, making it Palau's first formally legislated protected area. Palau achieved independence from the United States in 1994. Where Section 106 of the U.S. National Historic Preservation Act once safeguarded the RISL's cultural properties, an independent Palau enacted Title 19, the Cultural Resources bill which emulated the U.S. historic preservation laws. Tourism development became a major economic focus for the country. In response to increasing development pressure and visitor impacts, additional areas within the RISL were protected, culminating in the mandated management of the entire RISL through adoption of a Rock Islands Southern Lagoon Area Management Plan 2004-2008 in 2005. The Plan is currently being revised through a multiple stakeholder, collaborative process with the advice of Traditional Leaders. Revisions are specifically focused on fisheries and cultural sites, both of which needed more development in the original plan.



Koror State Department of Conservation and Law Enforcement. Photo courtesy of KSDCLE.

3. Justification for Inscription

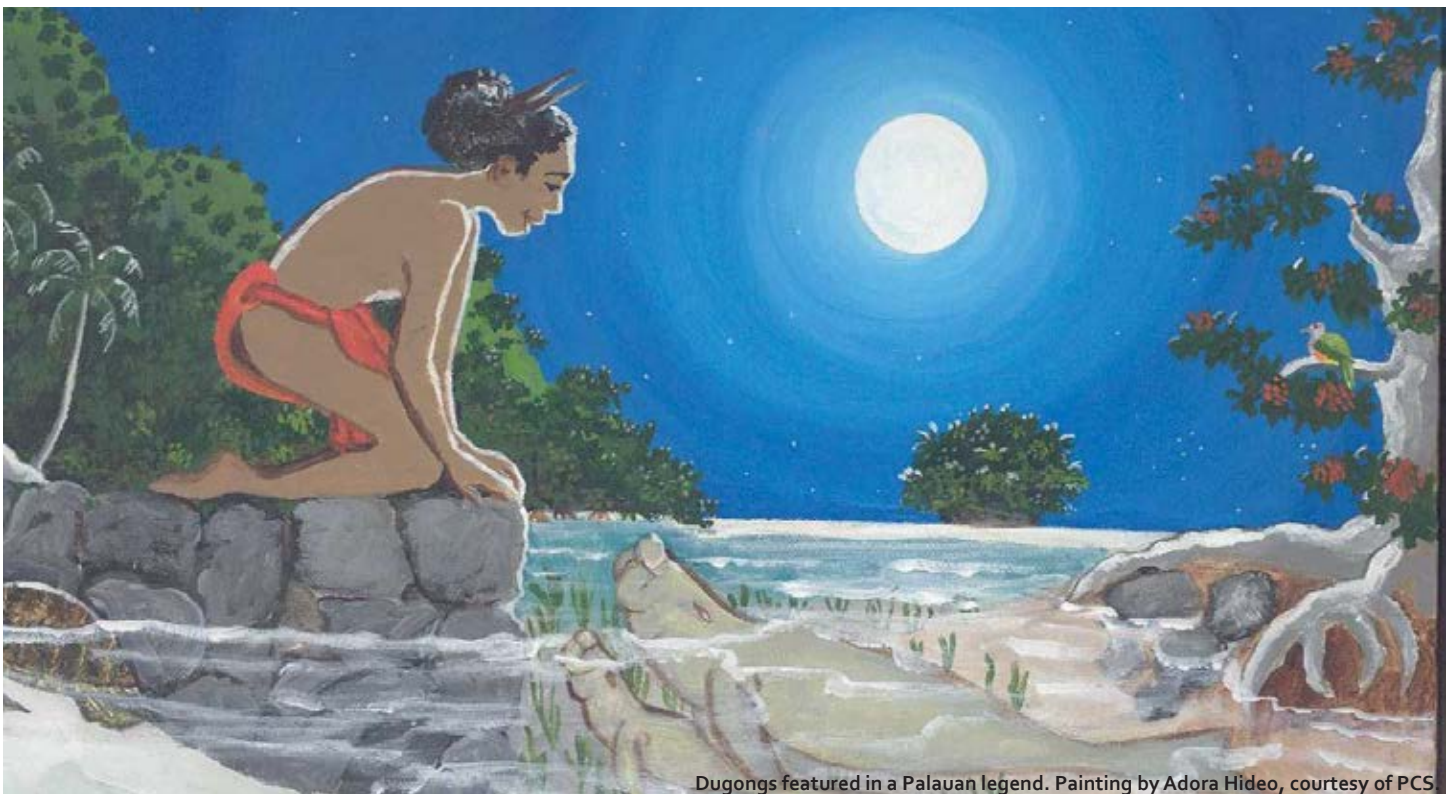
The Rock Islands Southern Lagoon is proposed for inscription on the World Heritage List as a mixed cultural and natural heritage site under criteria (iii), (v), (vii), (ix) and (x).

3.a - Criteria Under which Inscription is Proposed

Criterion iii. Bear a unique or at least exceptional testimony to a cultural tradition which is living.

The significant aesthetic and cultural values of the landscape of the Rock Islands Southern lagoon are integral to the identity of the nation.

Within an archipelago continuously inhabited for several millennia, the limestone islands' distinct environmental conditions have preserved a range of prehistoric sites and evidence for past cultural behaviour and environmental adaptations not found elsewhere in Palau. The RISL's culturally significant places, especially those associated with the first villages from which many Palauans derive, are recorded in oral history, myths, dances and proverbs, and in the traditional place names of its land- and seascapes. The archaeological remains of abandoned villages of the RISL bear exceptional testimony to Palauan culture from their status as the origin settlements of many Palauans. The village sites are uniquely preserved as they were abandoned *en masse* several centuries ago when the Rock Island



Dugongs featured in a Palauan legend. Painting by Adora Hideo, courtesy of PCS

populations migrated to larger islands. The relict cultural landscape of the RISL is of outstanding significance as it represents the ancestral homeland of traditional Palauan society which developed at the start of the 2nd millennium AD. Elsewhere in the Pacific, cultural homelands such as the Polynesian 'Hawaiki' and Fijian-West Polynesian 'Pulotu' are unlocalised and are not associated with the physical remains of an ancestral settlement system including its specialised sites such as rock art and burials sites. On Ulong Island, for example, a spectacular panel of rock art on Ulong is attributed to the culture hero Orachel who introduced the first *bai* – the elaborately decorated and pictograph painted house that is central to community identity – and named and ranked Palauan clans (McKnight 1964).

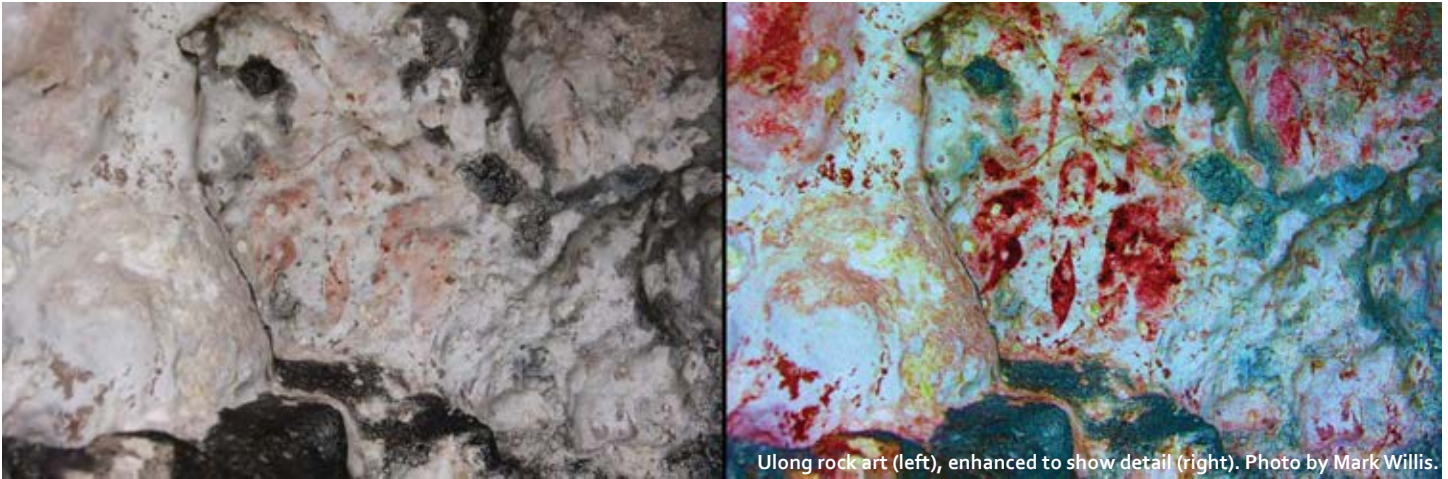
Palau is traditionally divided into a northern volcanic landmass containing the large island of Babeldaob known as the 'upper sea' and a southern group of smaller limestone Rock Islands and adjacent landmasses termed the *eou el daob* or 'lower sea'. Despite very limited potable water and arable soil, a network of substantial permanent villages were established in the Rock Islands around the start of the first millennium AD. Oral histories recount the movement of people from the Rock Island villages to other parts of the archipelago where new village settlements were established.

At least 13 villages once existed in the RISL with many verified through archaeological survey and excavation. Traditions record extensive migration to and from the RISL, and many Palauans assert that they originate from settlements in the Rock Islands. The origin stories of migration from the RISL are central to the identity of the people of Palau and are represented by villages histories that date to 'the time of ancestors' (*Er a Rechuodel*), which embodies the traditional ways of the ancestors before the changes brought about by Western contact.

The significance of stonework villages in the RISL is embedded in contemporary Palauan society by the material remains of structures, middens, gardens and fishing grounds and place names/stories/titles associated with the ancient stonework villages. Cultural links to the physical remains and history of the RISL are maintained by frequent visits by Palauans for fishing, recreation and the gathering and growing of plants for medicinal, economic and traditional activities, chiefly titles and house names. Continuing human use and reliance on the RISL, particularly the marine ecosystem, is evident in the Southern Lagoon. The extensive fishing and marine lore held by Palauans represents an intimate and exceptional continuing knowledge of the marine environment of the RISL from initial colonization 3000 years ago through to the present (Johannes 1981; Ono and Clark 2010).



The stunning Rock Islands. Photo by Patrick Colin.



Ulong rock art (left), enhanced to show detail (right). Photo by Mark Willis.

Criterion v. Be an outstanding example of traditional human land and sea use which is representative of human interaction with the environment especially when it has become vulnerable under the impact of irreversible change.

The archaeological evidence in the RISL represents an outstanding example of human occupation of a precarious environment. The abandonment of Rock Islands in the 2nd millennium AD is an exceptional example of the consequences of population growth and climate change to a human society living in a marginal landscape. The archaeological and palaeoenvironmental records of the RISL are outstanding because:

- They represent an exceptional record of human interaction with a tropical lagoon ecosystem spanning 3000 years;
- They contain the intact remains of a village system that, unique to Palau, was adapted to the fragile resources of small raised limestone islands;
- They are a premier example of the cause of landscape abandonment as they detail how the Rock Island village system succumbed to the effects of climate change, population growth and the overharvesting of local marine resources.

The Rock Islands consist of small raised karst landmasses with only sparse pockets of sand

plains and suitable gardening soil. This terrestrial environment is highly susceptible to climatic fluctuations. Recurrent droughts limit the production of starchy crops in sink holes and on sand plains, while access to potable water is dependent on a high and consistent level of precipitation to the freshwater aquifer (the Ghyben-Herzberg lens). In addition, El Niño/La Niña events disrupt marine organisms, especially the most common subsistence taxa, through increased variability in tidal range, sea temperatures, and nutrient concentration.

Currently Palau, in the wet equatorial zone, averages 3,700mm of annual rainfall. However, large-scale variation in precipitation is documented in Palau's palaeoclimate record with a wetter period at AD 950-1250, known as the 'Medieval Warm Period' (MWP), and an increasingly drier climate which peaked around AD 1650, referred to as the 'Little Ice Age' (LIA). During the transition from the MWP to the LIA, the decrease in precipitation was accompanied by increased frequencies of El Niño Southern Oscillation (ENSO) events. ENSO events result in fluctuations in the Walker Circulation, movement of the Inter-Tropical Convergence Zone (ITCZ), and increased sea-surface temperatures.

By AD 1250, at the end of the MWP, archaeological evidence shows intensification of human use of the RISL. Prior to this time the limestone islands had been used for specialised activities involving short term visits and seasonal camps. The oldest sites date to 3100 years ago and were camps where inshore



Stone money. Photo by Clark/Reepmeyer - ANU.

fish and shellfish were caught and consumed as typified by the early marine remains from Ulong Island (Clark 2005; Ono and Clark 2010). At this time human occupation of limestone islands was limited by an absence of coastal flats with beach sediments restricted to narrow fringing sands subject to inundation by storm waves and extreme tidal events. From 3000 to 1500 years ago sea levels across the Pacific declined ~1.5 m exposing barrier and fringing reef structures which increased the extent of beach deposits in the RISL through the erosion of reef structures. Human use of limestone islands increased with the emergence of coastal flats 2500-1000 years ago, but was limited to the use of limestone sea caves and fissures for burial (e.g. Chomedokl Island), ritual-territorial rock art and fishing camps (Ulong Island).

At the start of the 2nd millennium AD permanent occupation began with stonework villages established by AD 1250 on Ulong Island, Dmasech Island (Ngemelis Group), Ngeanges Island, Ngeruktabel Island and Mecherchar Island). The villages are archaeologically defined by dispersed stonework structures made from locally available coral limestone cobbles and boulders which were carefully stacked to construct house and sitting platforms, walls, pathways, docks and wells. These settlements formed a unique network or village system that existed by adapting to the severe topography of by karst landscapes and the marginal subsistence and social conditions posed by living on small resource-poor islands.

Social networks were vital to village food supplies within the RISL and to the maintenance of links to the communities and resources on volcanic islands in addition to strategic alliances for defence. Ceramic containers were imported from volcanic islands to the RISL and there was extensive redistribution of food, valuables and marriage partners among the ranked villages in the RISL (Snyder et al. In press) indicating a strong emphasis on marine activity and transport. This is also seen in the archaeological food remains from village sites in the RISL such as Ulong, Uchularois, Dmasech and Ngeruktabel (Masse 1989; Masse et al. 2006; Ono and Clark 2010), which reflect an overwhelming

emphasis on the collection of marine species, which is archaeologically visible in the stone remains of canoe docks and wharfs in the RISL.

Stonework villages in the RISL hold settlement remains and deposits of marine food remains that comprise an unparalleled archive of human behaviour spanning several centuries in a precarious tropical environment under the irreversible effects of climate change. These archives are of global significance as most of the 40% of the world's population currently living in, and adjacent to, the tropics will continue to be reliant on small-scale agriculture and near-shore marine resources, which are exposed to climatic fluctuations.'

The record of human use of marine resources in the Southern Lagoon spans 2500 years on Ulong Island and is especially detailed for the 400-500 years of stonework village occupation in the RISL, forming an exceptional example of traditional sea use in the tropics. The RISL village system became vulnerable and eventually collapsed in the 2nd millennium AD from the combined effects of climate change, population growth and an over-reliance on marine foods with over-harvesting caused a decrease in the size of some inshore taxa of fish and shellfish at Uchularois Island and Ulong Island (Masse et al. 2006; Ono and Clark 2010; **Figure 39**). Palauan traditions, historical records and archaeological dates demonstrate the RISL was uninhabited prior to European contact in AD 1783 with island abandonment most probably around AD 1400-1500 when palaeocores from a marine lake in the RISL show an unpredictable and dry climate (Sachs et al. 2009).

Criterion for cultural landscape nomination

The RISL is proposed for nomination as a cultural landscape because it meets the definition in Annex 3 of the Operational Guidelines for the implementation of the World Heritage Convention (UNESCO 2005) as representing the “combined works of nature and of man”, and is illustrative of *“the evolution of human society and settlement over time, under the influence of physical constraints and/or opportunities presented by their natural environment and of successive social, economic and cultural forces,*



Stone wall. Photo by Ron Leidich.

both external and internal (UNESCO 2005: Annex 3, Point 6). In addition to this, the Operational Guidelines state that cultural landscapes should be selected not only on the basis of their outstanding universal values but also *their representivity in terms of a clearly defined geo-cultural region and for their capacity to illustrate the essential and distinct cultural elements of such regions* (UNESCO 2005: Annex 3, paragraph 7). The islands in the geo-cultural region of Micronesia are distributed from the equator north to 20° latitude and 130-170° longitude; an area of 7.5 million square kilometers of Pacific Ocean. There are 2100-2400 islands, depending on how the islands are counted which have a total land area of 2700-3626 square kilometers and a mean island area of only 1.3-1.5 square kilometers. The dominant island type is the carbonate island consisting of atolls and raised limestone landmasses either as discreet islands or as limestone deposits capping volcanic/sedimentary strata. The carbonate islands of Micronesia have been described as 'hostile', 'precarious' and 'marginal' environments for humans, and a variety of subsistence and

behavioural innovations were required to establish viable settlements (Weisler 2001a,b).

The regional village system in the RISL is a case study illustrating the distinct cultural adaptations imposed by locating permanent villages on small environmentally depauperate islands. The settlement structure in the RISL was hierarchical with lower ranked villages owing tribute and allegiance to the paramount village (*klou el beluu*). Demand from the paramount for food, artefacts, women and weapons from subject villages was a constant source of inter-group friction. The defensive aspect of Rock Island villages is seen in the strategic placement of stone walls across sand plains and trails, along with the presence of numerous observation points on the ridges and peaks of limestone islands. These structures highlight the presence of endemic conflict, as do platforms and terraces high up in karstic terrain. The formation of ranked multi-village units in the Rock Islands allowed communities to use the widespread marine resources within the Southern Lagoon and to defend their



Traditional canoe. Photo by Mandy Etpison.



Rock art inside a cave. Photo by Mark Willis.

settlements when attacked by another district polity (*rengea*). The socio-political arrangement of the stone work village systems clearly illustrates the environmental and cultural tensions faced by people living in a marginal environment. The political hierarchy of villages bound the communities together so that the subsistence and defensive needs of dispersed communities could be met. However, tribute obligations, resource shortfalls and an increased frequency of warfare resulted in the permanent abandonment of the RISL village system. As a result of migration the social system from the RISL villages was preserved on settlements located on non-carbonate islands most notably those of Koror and Babeldaob. Micronesia is a 'sea' of small islands and is an environmental zone where the cultures of the human inhabitants are unusually susceptible to transformation from cultural and natural events. The cultural sites of the RISL, particularly the stonework village system, are representative and illustrative of the interplay between human and natural systems that is characteristic of the geo-cultural region of Micronesia.

It is proposed that the stonework village system in the RISL be considered an organically evolved landscape following Annex 3, paragraph 10 of the *Operational Guidelines* (category ii). The village system was the result of an initial social and economic imperative, shaped by the unique features of the natural environment of the RISL, namely: occupation of small rugged limestone islands with no standing source of freshwater and very limited gardening potential surrounded by marine resources

of reef, lagoon and ocean. The difficult subsistence conditions, resource-poor environment and marine setting of villages led to unique social and economic adaptations that differentiated the RISL village culture from that of settlements on Palau's larger islands. Stonework villages were shaped by the need to incorporate the natural defensive qualities of the rugged karst combining a dispersed settlement pattern with coastal access for essential marine foods. The adaptive process was also technological, as settlers had to learn how to obtain freshwater by tapping the Ghyben-Herzberg lens in wells, caves and springs and to intensively garden in sink holes and the back of coastal flats where freshwater percolates from limestone bedrock. Exploitation of the marine environment was essential for community survival and involved increased emphasis on outer reef species including the capture of pelagic sharks and tuna and intensive use of marine shell to substitute for the absence of volcanic stone (Ono and Clark 2010).

Stonework villages belong to the organically evolved landscape 'relict landscape' sub-category. The archaeological, historical and traditional evidence described in the nomination document and literature list indicate that by AD 1250 there were at least 13 stonework villages with an estimated population of 4000-6000 people in the RISL (Masse et al. 2006). The stonework villages were totally abandoned well before AD 1783 when Palau was first visited by Europeans, and the available chronological evidence indicates that islands in the RISL were uninhabited by AD 1400-1500. After population migration there was



Beach scene. Photo by Paul Collins.

re-vegetation of limestone islands and reduced impact on coastal-reef resources. Warfare, famine and drought are given as causes of depopulation in Palauan traditions while archaeological evidence shows that population growth and human predation on inshore marine species was increasing prior to island abandonment (Masse et al. 2006). High-resolution palaeoclimate records from marine lakes in the RISL demonstrate that during the Little Ice Age (AD 1400-1800) Palau had a drier climate from the southward movement of the Intertropical Convergence Zone (ITCZ), which supplies rain to equatorial landmasses (Sach et al. 2009; Smittenberg et al. 2011). Human abandonment of islands took place, therefore at a time when archaeological data indicates that human settlements were exceeding the capacity of the marine and terrestrial environments in the RISL to support them. A drier climate reduced the amount of potable and crop growing water. Environmental pressure caused increased societal stress and conflict within the stonework village system that is recorded in Palauan traditions of warfare and migration from the RISL (e.g. the abandonment of Ulong village and Metukerukull village on Ngeruktabel Island from warfare).

The archaeological remains of the individual settlements comprising the village system are relics of cultural, social and economic practices, which always occur together and were only developed in the RISL. The village remains consist of stone occupation structures, defensive walls, ritual sites, wells, trails, abandoned gardens and plantations holding rich midden and artefact assemblages. The prehistoric sequence of village occupation and abandonment in the RISL is the premier example in the tropical island world of the societal effects of climate change, population growth and the breaching of ecological thresholds, especially when combined with Palauan traditions and high-resolution palaeoclimate records from marine lakes in the RISL. The historical outcomes of the RISL village system and climate change with global significance in the 21st century are social fragmentation, migration and the creation of a relict island landscape.

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

Hundreds of lush green islands lie within the pristine blue waters of the RISL. The breathtaking beauty of this sea and landscape creates an instant sensation of wonder for all who view its splendor. The diverse and complex marine and terrestrial habitats offer every hue and color of the rainbow, providing a sense of timelessness and inspiration that words and images cannot fully express. Ancient legends and chants, old and new songs, poetry, and countless films, documentaries, videos, television programs, books, photographs, murals, and posters have tried to capture the wonder of the Rock Islands from the air, land, and sea. *This Living Reef* (1974) by photographer Douglas Faulkner was one of the first attempts to capture the beauty of the RISL. The RISL was featured in the 1995 Academy Award-nominated IMAX film *The Living Sea*, in a 1998 episode of the Public Broadcasting Service series *The Living Edens*, the 2008 IMAX film *Planet Blue*, and most recently, its migrating golden jellyfish in Jellyfish Lake were featured in an episode of the 2010 National Geographic series *Migrations*.

The emerald islands of the RISL have a full representation of raised limestone islands, from high cliffs to flat platforms to the iconic mushroom shapes. The islands' gentle contours and various shapes fill the mind with images of peaceful demigods resting in a tranquil lagoon of antiquity. The famous Jellyfish Lake offers a mesmerizing experience of the phenomena of millions of golden jellyfish pulsating around you, each lost in its own liquid waltz (Kitalong Hillman 2000). The RISL has a higher density of marine lakes compared to any other place on earth of similar area. The colorful and diverse coral gardens, steep drop-offs and channels with strong exhilarating currents and large feeding and spawning aggregations of fish and sharks, tranquil coves and lakes, and the rare encounter with a turtle, crocodile, or dugong provide an ecosystem of rare natural phenomena and beauty and the experience of a dream come true.



Nudibranch. Photo by Paul Collins.

The islands of PELEW, when viewed from the sea, exhibited high rugged land, well covered with wood. The interior part was in many places mountainous, but the vallies were extensive and beautiful, spreading before the eye many delicious prospects.

George Keate, 1788



Palau Flycatcher. Photo by Eric VanderWerf.



Spadefish. Photo by Paul Collins.

Criterion ix: to be 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.

The marine lakes within the Rock Islands Southern Lagoon are an outstanding example of significant ongoing ecological and biological processes in the evolution of marine ecosystems and communities of plants and animals. Marine lakes have the physical appearance of islands—i.e., they are bodies of one habitat (seawater) entirely surrounded by another (land). As other islands, therefore, marine lakes may be to the ocean what oceanic islands are to the land (Dawson et al. 2009): simpler microcosm[s] of the seemingly infinite complexity of continental and oceanic biogeography with the necessary replications in natural experiments by which evolutionary hypotheses can be tested (MacArthur and Wilson 1967).

Since 1995, extensive scientific research has been conducted to examine whether the marine lakes might have the same significance in marine biology that oceanic and coastal islands have in terrestrial biology (e.g., Whittaker and Fernández-Palacios 2007; Losos and Ricklefs 2010). These investigations include biotic surveys in 14 lakes, population genetic characterization of three species, documentation of morphological and behavioral variation, establishment of long-term monitoring of physical dynamics in 15 lakes, and long-term monitoring of coupled-biophysical variation between two to five lakes. Although only a portion of this work is published to date, there is a strong inference that marine lakes are effectively the Galapagos of the seas, providing unparalleled opportunities to study the ecology and evolution of marine taxa (Dawson et al. 2009).

Populations of marine lake organisms are endemic to single lakes (e.g., Dawson and Hamner 2005; Gotoh et al. 2009; Dawson unpubl.) with each



Mastigias papua etpisoni. Photo by Patrick Colin.



Endemic *Nautilus belauensis*. Photo by Patrick Colin.



Astrosarkus idipi, described from Palau. Photo by Patrick Colin.



Subsistence fishing. Photo courtesy of PCS.



Students hug Finny the Shark during outreach visits. Photo courtesy of PCS.

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

The RISL ecosystem includes numerous and diverse habitats and functional groups from decomposers to producers to apex predators within a relatively small area. Barrier reefs, fringing reefs, patch reefs, reef holes, reef channels, the shallow and deep lagoon, marine lakes, beaches, seagrass beds, mangroves, littoral forests, and limestone forests are all habitats found within the RISL. These habitats are healthy and intact, and there is effective *in situ* conservation to protect and preserve the biological communities. A diverse assemblage of biota are found within each habitat including Palau's endangered megafauna (dugongs, crocodiles, birds, hawksbill and green sea turtles), and hundreds of species of fish, coral, and other invertebrates and algae.

Each of the RISL's 52 marine lakes is unique, with a diverse selection of habitats and communities that have evolved over time. Biotic surveys of 14 marine lakes documented 311 marine invertebrate species (sponges, molluscs, echinoderms, sea squirts, and jellyfish), of which 131 (43%) are previously unknown species that are likely new to science (CRRF unpub. 2010). Species composition segregates according to the unique physical features of each lake, with species overlap among lakes with similar characteristics. As such, the RISL lakes represent a complete continuum from the most isolated lakes to those most connected to the lagoon. Given the number of lakes yet to be comprehensively surveyed there is a high probability of more new discoveries of species found nowhere else on earth. The limited access and effective management of the lakes ensures *in situ* conservation and preservation of these outstanding natural habitats.

population morphologically distinct (Dawson 2005 a, b). Endemic lake populations also show behavioral adaptations to lake-specific selective forces (Hamner and Hauri 1981; Dawson and Hamner 2003). Genetic analyses of marine lake jellyfish are the first published data showing consistency between patterns of evolution in marine taxa with patterns of evolution in terrestrial taxa on oceanic islands (Dawson and Hamner 2005), a pattern that is also evident in the evolution of size, antipredatory phenotypes, and in the assembly of communities (Dawson et al. unpubl.). Five new subspecies of *Mastigias* (Scyphozoa: Rhizostomeae: Mastigiidae) have evolved from marine lakes within the RISL (Dawson 2005a). Further understanding of the evolution of these systems depends upon their conservation in a pristine state and the avoidance of threats such as invasive species that have devastated the endemic biota of terrestrial oceanic islands.

Ten of the newly described or named species of invertebrates from Palau's marine lakes have not yet been found in the surrounding lagoon. These include a sea anemone (*Entacmaea medusivora*, Fautin and Fitt 1991) found in five of the stratified lakes and a sponge (*Haliscara cerebrum*, Berquist and Kelly 2004) found in three of the stratified lakes. Four different ascidian species, or sea squirts, have been described from a variety of lakes (*Eudistoma inauratum* and *Pyura styeliformis*, Monniot and Monniot 2001; *Didemnum mekeald* and *E. partitum*, Monniot and Monniot 2008) and four have only been found in a single lake each (*Ecteinascidia remanea*, Monniot and Monniot 2001; *D. lacustre*, *D. abu*, and *Lissoclinum tumidum*, Monniot and Monniot 2008). With future data analysis, species descriptions, and collections the degree of endemism in the marine lakes of the Rock Islands Southern Lagoon will become more apparent.

Ngerumekaol Channel and Denges Pass within the RISL are healthy and protected fish spawning aggregations that include a variety of fish species (Johannes 1981, 2000; Kitalong and Oiterong 1992; Johannes et al. 1999; Colin 2009). Intensive multi-species coral spawning occurs in Nikko Bay and Lighthouse Channel within the RISL (Penland et al. 2004). These healthy and robust populations of spawning fish and coral species contribute to the preservation of key ecological processes that are critical for the overall health of the reef. In many of the world's coral reef ecosystems, pollution, dynamite fishing, overharvesting, and dredging of reef habitat has disturbed and stressed these key ecological processes, decreasing their resilience and making them more vulnerable to future disturbance. The reefs of the RISL remain nearly pristine and, as such, are an important area for conservation of global marine biodiversity.



Tourists in the RISL. Photo by Ron Leidich

My search for the bird and its relatives took me on a journey where numbers melt in the heat and are washed away by pounding rain and where the uniqueness of one individual tells the story of millions.

Michael Parfit, "Islands of the Pacific," *National Geographic*, in describing his search for the Palau Fruit Dove among Palau's Rock Islands. <http://ngm.nationalgeographic.com/ngm/0303/feature5/index.html>.

Moreover, these intact coral reef systems, and their corresponding ecological processes, aid in the reef system's resiliency to the impacts of climate change. During the 1998 ENSO event, worldwide coral bleaching occurred, including in Palau. Within the RISL 90 percent of *Acropora* coral bleached, of which more than half recovered (Bruno et al. 2001). Corals fringing the rock islands had a lower percentage of bleaching and mortality compared to other more exposed reef habitats, perhaps due to the shade provided by those islands (Golbuu et al. 2007b). These unaffected coral populations may have played a critical role in Palau's reef recovery by providing some of the coral larvae as recruits for more impacted areas.

All of Palau's known endemic birds, mammals, and herpetofauna are located in the RISL. An estimated 42 percent of Palau's 130 endemic plants have been recorded in and vouchers collected from the RISL (Costion et al. 2009; Kitalong et al. 2009). The RISL includes the IUCN endangered *Cycas micronesica*, the endangered palm, *Hydriastele palauensis* and the critically endangered endemic *Ponapea palauensis*, found only within the RISL. The Ngerukewid Islands Wildlife Preserve within the RISL is the second oldest preserve in the Pacific and one of the least disturbed and most pristine terrestrial ecosystems in Micronesia (Birkeland and Manner 1989). Two decades ago, this complex was free of all six of Palau's introduced mammals—shrews, mice, and rats (Wiles and Conroy 1990). Effective management of this closed island complex has likely kept it free of introduced species.



A conservationist in the field. Photo courtesy of PCS.



Statement of Outstanding Universal Value

The Rock Islands Southern Lagoon is an exceptional example of man and nature's ability to co-exist and co-evolve in unique ways.

The Rock Islands Southern Lagoon is an outstanding example of human interaction with a precarious environment. The abandonment of Rock Island villages in the 2nd millennium AD is an exceptional illustration of the intersection and consequences of climate change, population growth, and subsistence behavior to a human society living in a marginal environment. The Rock Islands are small limestone islands with sparse pockets of sand plains and arable soil. This terrestrial environment is highly susceptible to climatic fluctuations such as those that occurred during the transition from the 'Medieval Warm Period' to the 'Little Ice Age' in the first and second millennium AD. A combination of human impact on coral reef resources and the decline in productivity of terrestrial resources during the 'Little Ice Age' made it impossible to sustain permanent settlements in the Rock Islands. As a result, villages in the RISL were abandoned at AD 1650-1750 and the population migrated to adjacent larger islands with more plentiful resources.

The Rock Islands Southern Lagoon bears exceptional testimony to a living cultural tradition. Contemporary Palauans state that they originated from ancestral Rock Island settlements. Hence, the significant aesthetic and cultural values of the RISL are integral to the identity of the nation. The limestone islands have sustained a range of prehistoric sites, such as cave burials and rock art, and evidence for past cultural behavior not preserved elsewhere in the archipelago. Continuing knowledge of the lagoon ecosystem is fundamentally related to the current capture and collection of life-sustaining marine foods. Rock Island archaeological sites and culturally significant places are recorded in Palau's oral history, legends, myths, dances, proverbs, and in the traditional place names of the land- and seascape.

The Rock Islands Southern Lagoon is among the most diverse, complex, and breathtakingly beautiful places on earth. Hundreds of unique mushroom-shaped islands and sparkling white sand beaches are scattered across a pristine turquoise lagoon. Moss-covered stones whisper secrets about man's abilities, and paintings on nature's walls tickle our senses. Barrier and fringing reefs, channels, tunnels, caves, arches, and coves filled with diverse assemblages of organisms of every color create a wonderland of natural beauty and discovery. Ancient legends and chants, award-winning films and documentaries, hundreds of photographs and works of art, and shelves of books and magazines try to capture the timeless magnificence of the RISL in words and images.

(continued)

Statement of Outstanding Universal Value

(continuation)

The Rock Islands Southern Lagoon contains 52 marine lakes — one of the most unique habitats in the world. No other place on earth has this number and variety of marine lakes within a similarly sized area. The lakes are diverse in biota and habitats making each one unique. Ongoing research on the marine lakes is increasing scientific understanding of evolution and speciation. Five new subspecies of *Mastigias papua* jellyfish have been described from these marine lakes and logic suggests that populations of many other species will also, when studied, be discovered and recognized as endemics with long evolutionary histories delimited within individual lakes.

The Rock Islands Southern Lagoon has exceptionally high biological and marine habitat diversity compared to similarly sized areas in the world and is a universally important coral reef ecosystem. In a near pristine area of high diversity, it is one of the best managed coral reef systems outside of the Coral Triangle. Located just east of the Coral Triangle, the RISL's coral reef systems are potentially an important producer of coral larvae for the entire region. The resiliency of the RISL's reefs make it a critical area for the protection of biodiversity. With low fishing pressure, little pollution, and minimal human impact, the Rock Island reef systems serve as a natural laboratory for scientific understanding of coral reef recovery from a major warming event caused by climate change. All the endangered megafauna of Palau, 746 species of fish, over 385 species of corals, at least 13 species of sharks and manta rays, 7 species of giant clams, and the endemic nautilus are found in the RISL. The RISL forests include all of Palau's endemic birds, mammals, herpetofauna and nearly half of Palau's endemic plants.

The Rock Islands Southern Lagoon is among the best managed and protected areas in the Pacific, and possibly the world. The traditional laws or *bul* of the people of Palau, the Constitution of the Republic, National laws, and Koror State Laws protect all significant cultural and natural resources including endangered species, critical habitats, and cultural sites. Traditionally, Palauans have conserved and protected these rare and valuable resources for thousands of years. The Ngerukewid Islands Wildlife Preserve established more 50 years ago shows the foresight of the National Government to protect its most valuable and aesthetically beautiful Rock Islands. The State of Koror has been a leader within Palau and the world by showcasing effective management and conservation of the RISL. The community and leadership of Koror fully supports the establishment of the RISL as World Heritage Site and is committed to keeping the RISL as one of the last great places on earth.



Photo Mandy Etpison

3c. Comparative Analysis

Comparative Analysis – Cultural Heritage Sites

The unique values of prehistoric sites in the Rock Islands were compared to other relevant World Heritage properties by concentrating on two thematic elements represented in the cultural landscape of the Rock Islands:

- Human adaptation to a precarious environment and subsequent abandonment of the landscape

resulting from climate change and over exploitation of the marine ecosystem.

- The cultural landscape is central to national identity as articulated in traditional history, island place names, and the migration-origin stories of the Palauan people.

Table 6. A summary of the portfolio of cultural landscapes reproduced from Smith and Jones (2007: Table 1, 65) (continued)

State Party	Name	Landscape type	Theme(s)
Chile	Rapa Nui	Organically evolved, relict. Associative	Environmental restrictions and catastrophe , Polynesian settlement pattern
Hawaii (USA)	North Kohala	Organically evolved, relict	Polynesian sweet potato horticulture and settlement pattern
	Mauna Kea	Organically evolved, relict. Associative	Polynesian stone quarries, ritual
	Papahānaumokuākea Marine National Monument*	Associative land- and seascape	Seascape, Polynesian traditions, WWII
Polynésie Française	Taputapuātea, Raiātaea	Associative land- and seascape	Polynesian traditions, social organization, oceanic voyaging and navigation
	‘Opunohu Valley, Mo’orea	Organically evolved, relict	Polynesian settlement pattern
	Rapa	Organically evolved, relict	Polynesian settlement pattern, traditions, environmental restrictions , fortifications and warfare
	Atoll marae, Tuamotu Archipelago* (Napuka and Tepoto Is)	Organically evolved, relict. Seascape and landscape. Part of Central Pacific World Heritage Project	Polynesian settlement pattern, oceanic voyaging and subsistence
Republic of Kiribati	Line Islands* (Kiritimati and Tabuaeran Is)	Associative and relict landscape and seascape. Part of Central Pacific World Heritage Project	Micronesian (Polynesian?) traditions, social organization, navigation
Republic of Marshall Islands	Bikini Atoll*	Associative seascape	WWII, Cold War imperialism, thermonuclear tests, forced population movement

Cultural landscapes in the Republic of Palau

The islands of Palau were probably occupied around 3500-3000 years ago by a Neolithic migration out of Island Southeast Asia (Clark 2005). Analysis of sediment cores on Babeldaob indicate vegetation disturbance, including a marked decline of forest taxa (Welch 2002; Athens and Ward 2005) and the occurrence of giant swamp taro (*Cyrtosperma merkusii*), that could represent earlier human arrival in Palau 4500-4000 years ago (Athens and Ward 2001, 2005). These vegetation changes may reflect, however, natural events as palaeoclimate data shows an increased frequency of ENSO events at this time (Gagan et al. 2004).

Human impact on Palau's environment increased from 3100 to 2000 years ago indicating continued prehistoric occupation after colonization (Athens and Ward 2001). On the main volcanic island of Babeldaob human settlement expanded into upland areas, and in the Rock Islands there is evidence for the collection of marine foods and use of limestone caves for human burial (Fitzpatrick 2003a,b,c; Liston 2009). Around 2000 years ago the volcanic islands experienced major erosion with sediments from upland zones deposited downslope onto the coastal flats. Sediment movement is linked to the construction of substantial earthworks in Babeldaob's upland areas (Liston 2009) and the

Table 6. A summary of the portfolio of cultural landscapes reproduced from Smith and Jones (2007: Table 1, 65) (continuation)

State Party	Name	Landscape type	Theme(s)
New Zealand/ Aotearoa	Mangaia (Cook Islands)	Organically evolved, relict and continuing elements	Polynesian horticulture, wet and dry
	Bay of Islands	Organically evolved, relict. Associative	Polynesian settlement patterns, fortifications, horticulture. Associations with the colonial process in New Zealand
	North Taranaki fortified landscape	Organically evolved, relict. Associative	Polynesian settlement patterns, fortifications. Associations with the colonial process in New Zealand
Fiji	Sigatoka dunes and Sigatoka valley*	Organically evolved, relict	Lapita and Polynesian origins, navigation, environmental change
Tonga	Lapaha Royal Tombs and the Tongan maritime chiefdom	Associative and relict, ongoing funerary functions	Polynesian social origins/ideology
Solomon Islands	Reef/Santa Cruz Islands*	Organically evolved, relict and continuing elements	Lapita and the originating populations of Polynesia. Arboriculture and tree crop selection and/or domestication
	Bellona and East Rennell*	Associative land- and seascape	Polynesian outlier, settlement pattern
	Marovo Lagoon*	Associative land- and seascape. Relict elements.	West Pacific (Papuan) social origins/ideology; relict forest pattern
	Tikopia	Organically evolved, relict and continuing elements. Associative	Polynesian outlier, settlement pattern. Associations with the history of anthropology
Papua New Guinea	Kuk and the origins of wetland taro	Organically evolved, relict	West Pacific (Papuan) horticulture and plant domestication
	Arawe Islands	Organically evolved, relict	Lapita and the originating populations of Remote Oceania
Palau	Babeldaob hill terraces and traditional village settlements	Organically evolved, relict	West Micronesian (Austronesian) settlement pattern, fortifications

* Places with intrinsic biodiversity values

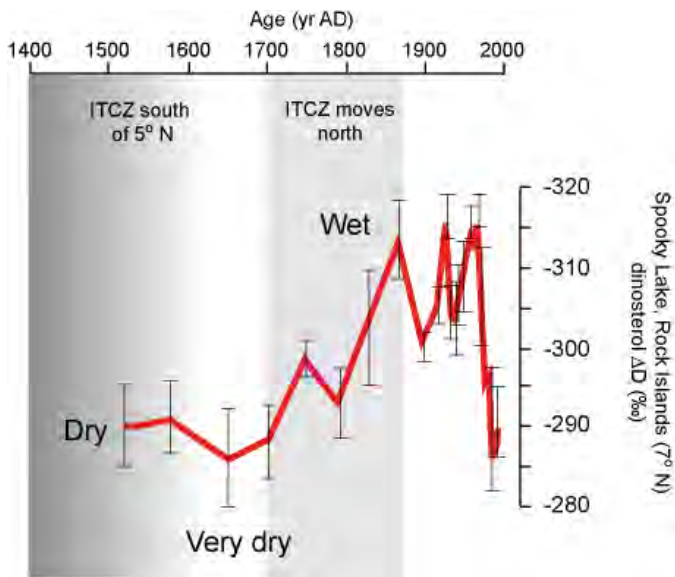


Figure 38. Climate change during the occupation of the Rock Islands. From Sachs et al. 2009

expansion of horticulture. During this time, the Rock Islands were used intermittently, but the presence of multiple cave interments suggests that local groups were marking territorial areas in the RISL through burial practice.

The transition from constructed earthworks in upland locations to stone village constructions in both lowland and upland parts of Babeldaob took place between AD 700-1200 (Wickler 2002; Liston 2009). The cause of the significant change to the community settlement pattern is unclear, with potential factors including an increasing frequency of warfare and the possibility that interior gardening soils had been depleted of nutrients.

Stonework villages in the 2nd millennium AD were frequently located in areas near the lagoon behind a thick border of coastal mangrove, which provided canoe shelter and guarded villages against attack from the sea. The marshy ground at the interface between the mangrove forest and the volcanic sediments was used to grow swamp taro (*Cyrtosperma merkusii*) with cultivation of dry and wet types of taro on adjacent hill sides and in areas supplied with freshwater. In the Rock Islands stonework villages were not established until AD 1000-1250 after there had been a phase of resource intensification in the volcanic islands. Intensification of crop production is associated with the benign

climate conditions of the 'Medieval Warm Period' (MWP).

During the MWP, human populations moved out of the volcanic islands, and established for the first time, permanent stonework villages on limestone islands in the RISL. Major disruption to the Rock Island stonework village system occurred around AD 1500-1650 with complete abandonment of the limestone islands by AD 1700-1750, and migration of the Rock Island population to islands north and south. Palauans continued to use the RISL's marine resources, and Yapese voyagers came to the limestone islands to quarry disks of calcite stone money, but the Rock Islands were never again inhabited permanently (Snyder and Butler 1990; Masse et al. 2006).

Two cultural properties on Palau's World Heritage Tentative List (<http://whc.unesco.org/en/tentativelists/state=pw>) – the Imeong Conservation Area (Mixed) and the Ngebedech Terraces (criterion ii, iii, v) – share several elements with the RISL. The Imeong Conservation Area in Ngaremlengui State contains a stonework village (Ngerutechei) dating to the 2nd millennium AD and the sacred rock shelter *Ii ra Milad* where the goddess Milad lived, which is an ancestral site of the Palauan population. The Ngebedech Terraces are prehistoric earthwork constructions consisting of sculpted hills and ridges in Aimeliik State, which appear to represent the physical remains of pre-stonework communities in the first millennium AD. There are significant points of difference between the cultural values of the RISL stonework village sites and these properties as outlined below:

- The Imeong Conservation Area and Ngebedech Terraces are on the volcanic island of Babeldaob and contain environmental zones such as savannah, rain forest, wet land and mangrove swamp that are not found in the RISL. The cultural values of the RISL derive from the unique association between the inhabitants of the rock islands and the marine environment of the RISL, which was essential for population survival. This level of dependence

on marine resources is not associated with stonework villages on the volcanic islands due to a greater emphasis on the cultivation of starchy crops.

- Stonework villages on volcanic islands and volcanic-limestone islands elsewhere in Palau such as Ngerutechei are built of volcanic stone and have a different community layout than villages in the RISL due to the rugged topography of limestone Rock Islands. As summarized in **Figures 38-39** and accompanying text the RISL village settlements were less hierarchical than the social system on the main island as shown by the smaller scale of the stone (coral reef limestone) architecture and less formal and diverse sets of villages remains. In the RISL villages, the largest stone constructions were defensive walls across coves and beaches while on volcanic islands the largest stone constructions were house platforms, roads and canoe docks. It is noteworthy that the stonework villages on Babeldaob date later than the stonework villages in the RISL (Smith and Jones 2007:114; Clark and Reepmeyer in press) consistent with the tangible evidence supporting the existence of unique cultural adaptations in the RISL as a result of environmental forcing in a precarious environment.

The abandonment of stonework villages in the RISL created a relict landscape similar in some respects to the abandoned earthworks like those of the Ngebedech Terraces on Babeldaob. The points of difference between the RISL and earthworks in addition to those mentioned above are:

- The RISL property includes almost all of the stonework villages that comprised the village system including specialized site components such as wells, rock art, burials and ceremonial/religious sites. Collectively, the RISL cultural sites comprise an outstanding ensemble illustrating prehistoric human occupation of a marginal environment.
- Island abandonment preserved the authentic

structure of stonework villages and importantly the physical remains associated with prehistoric occupation of the RISL. These materials indicate population growth and over-harvesting of marine resources prior to migration (Masse et al. 2006). The soils of Babeldaob are generally highly acidic and archaeological remains with which to understand the abandonment of earthworks are either not present or recoverable in small quantities. Specific to the RISL is a high-resolution palaeoclimate record extracted from marine lakes that identify a dry and unpredictable climate during the time when stonework villages were abandoned (Sachs et al. 2009; Smittenberg et al. 2011). The archaeological and palaeoclimate records of the RISL provide unique insight to the historical process of landscape desertion that illustrate human interaction with the environment when it became vulnerable under the irreversible effects of climate change.

- The archaeological sites of the RISL, especially the stonework villages are part of the living cultural tradition from their status as origin settlements for much of the Palauan population and the perpetuation of RISL history through oral history, poems, paintings, carvings dances and songs. The cultural connection between Palauan people and the RISL natural and cultural landscape is perpetuated by frequent visits to the RISL by Palauans for recreational activities, subsistence fishing and crop growing, and the collection of medical and economic plants and animals. In contrast, the relict landscape of the Ngebedech Terraces and other earthworks is not linked to an extensive set of living traditions or regular visits by Palauans. Indeed, there are no known oral traditions providing a generic explanation of how or by whom earthworks were constructed, and the earthworks are not among the legends, historic events and significant symbols decorating the beams of each village's *bai era rubak* (chiefly

meeting hall) that were meticulously copied by Elizabeth Krämer (1929) in 1909 and Hijikata (1996) in the late 1920s (Liston and Miko in press). The village and cultural sites of the RISL are, therefore, the outstanding example of traditional human settlement in the lagoonal seascape of Palau.

Human adaptation to a precarious environment and abandonment of the landscape resulting from climate change and over exploitation of the marine ecosystem.

1. Climate change

The terrestrial environments of the Rock Islands are highly susceptible to climatic fluctuation. Long-term human occupation demands stable supplies of food and freshwater. Recurrent droughts affect the growth of starchy crops and supplies of potable water are dependent on high levels of precipitation to continuously recharge the freshwater aquifer (Ghyben-Herzberg lens). Recent studies on marine lake sediments in the Rock Islands indicate that the transition from the MWP to the LIA was associated with an increase in the frequency of ENSO events (Sachs et al. 2009). The increased variability in tidal range, sea temperatures, and nutrient concentration during El Niño/La Niña events disrupt marine systems, particularly the common subsistence taxa collected by people. Following fluctuations in the climate starting around AD 1000, the Rock Islands experienced an increasing frequency of dry weather during the LIA (Sachs et al. 2009). Precipitation levels began to fall around AD 1400 and reached their lowest ebb around AD 1650 (**Figure 38**).

Several World Heritage sites are inscribed under Criterion V of the operational guidelines that has the survival of a population in a harsh environment as a major theme (Fowler 2003). These include Uluru-Kata Tjuna National Park (Australia), Pyrénées-Mont Perdu (France/Spain), Portovenere, Cinque Terre, and the Islands Palmaria, Tino, and Tinetto (Italy), Ouadi Qadisha (the Holy Valley), the Forest of the Cedars of God (Horsh Arz el-Rab) (Lebanon), Sukur Cultural Landscape

(Nigeria) and Ivvavik/Vuntut/Herschel Island (Canada).

The vulnerability of prehistoric societies to periods of dramatic climate change such as from the climatic optimum in the Medieval Warm Period (MWP) to the Little Ice Age (LIA) in World Heritage is included within the concept of: landscape abandonment because of irreversible environmental change. An appropriate example is the World Heritage Mapungubwe Cultural Landscape in South Africa. The relict landscape was caused by increasing droughts during the LIA in the 14th century, which limited the agricultural capacity of the land to sustain a large population. The direct consequence of climate change in Mapungubwe was the large-scale migration of people into neighboring regions which supported the rise of substantial political entities, particularly that of the World Heritage site of Great Zimbabwe (Zimbabwe). Similarly, in Palau climate change depressed the subsistence capacity of the Rock Island population to a point where social fragmentation and migration resulted in a relict island landscape.

2. Human impact on the marine ecosystem

The Rock Island's cultural sequence is a three millennia long record of human adaptation to an environmentally depauperate landscape. In this, cultural sites in the Rock Islands can be compared to several other World Heritage sites, such as the 2000-year human sequence of the St Kilda Archipelago in the north of Scotland where the small population inhabiting a marginal environment was similarly reliant on a combination of wild foods (fish and sea birds) and small-scale agricultural production for its survival. The production of starchy root crops was very limited in the Rock Islands compared to the rich food resources of the RISL. As a result subsistence was particularly focused on the extraction of marine resources to supply dietary and material culture needs. The importance of marine resources to Rock Island settlements is seen in traditions about the cause of conflict between Koror and Metukeruikull. The people of Metukeruikull on Ngeruktabel Island forbade the people of Koror entry to their rich fishing grounds, and they killed

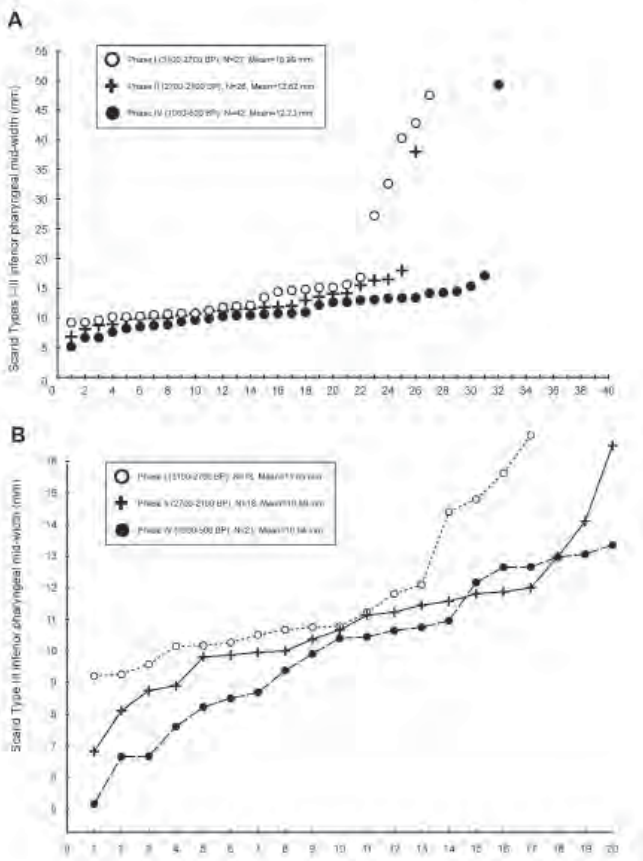


Figure 39. Size decrease in Scarids (parrotfish) in the Rock Islands. From Masse et al. 2006

- Mollusks (*Strombus gibberulus*, *Tridacna* sp., *Hippopus hippopus*, *Trochus niloticus*, *Lambis* sp., *Conus* sp., *Nerita* sp.)
- Bony and cartilaginous fishes (Labridae, Scaridae, Diodontidae, Monacanthidae, Lutjanidae, Lethrinidae, Holocentridae, Elasmobranchii)
- Turtles (e.g., *Chelonia mydas*, *Eretmochelys imbricata*)
- Sea urchins (*Tripneustes gratilla*)
- Lobsters (*Panulirus pencillatus*, *Panulirus versicolor*)
- Crabs (*Scylla serrata*, *Portunus pelagicus*, *Heterocarpus* spp., *Geryon* sp.)
- Saltwater crocodiles (*Crocodylus porosus*)
- Dugongs (*Dugong dugon*)

The absence of volcanic stone in the Rock Islands resulted in the widespread use of shell to make domestic and ceremonial items. Prehistoric shell artifacts found in the Rock Islands include adze blades made in *Tridacna* sp. and *Terebra* sp., knives, chisels, scrapers, and small adzes in *Tridacna* sp., *Conus* sp., *Anadara* sp., *Cassis* sp., spoons and gorgets in *Tridacna* sp., *Conus* sp., *Terebra* sp., peelers/scrapers in *Pinctada margaritifera*, and ornaments/shell money in *Pinctada* sp., *Tridacna* sp., *Trochus* sp., *Conus* sp., *Terebra* sp., and *Cypraea* sp.

Human occupation has had negative effects on the biota of many islands in the Pacific and elsewhere (e.g., Hawaiian Islands, Fiji, New Zealand, Mauritius, Caribbean Islands). When combined with climatic factors such ecosystem changes can have consequences that are catastrophic for human societies. The Rapa Nui National Park (Chile) World Heritage site is an example of these calamitous consequences. Scientific research on the prehistoric use of Palau's coral reefs has focused on the Rock Islands due to the exceptional preservation conditions of the limestone sediments. Two archaeological sites have fish and shellfish remains which chart human use of marine resources over 3000 years. Midden assemblages from several other sites date to the last 1000 years when stonework villages briefly flourished in the Rock Island prior to the extinction of the village system.

the chief of Koror (Ibedul) who they found while on a fishing expedition (Nero 1987:130); an event that precipitated warfare and island depopulation.

Human influence on the marine ecosystem of Palau is well documented compared with impact on the terrestrial habitat through the construction of village sites and clearance of island vegetation. It is unclear when major disturbances to the Rock Island's native vegetation occurred because palaeoenvironmental studies have focused on the volcanic island of Babeldaob, but it is likely that native vegetation clearance was extensive in prehistory.

The ethnographic and archaeological record of marine use demonstrates that Palauans have been collecting and using a wide variety of marine resources sourced from coral reef environments for at least 3100 years. Marine subsistence taxa taken include:

At Uchularois Cave, adjacent to the island of Dmasech, the fish and shellfish remains provide firm evidence for the decline of marine species as a result of human collection practices during the occupation of stonework villages. This is represented by a significant increase in taxa abundance (parrotfishes, Scaridae; leatherjackets, Aluteridae; porcupinefishes, Diodontidae; wrasses, Labridae) concurrent with a decrease in overall fish taxa diversity. The size decrease in the mouth parts of the two most abundant fish species, the large-eyed bream (*Monotaxis grandoculis*) and parrotfish (*Scarus* sp.), indicates that human predation was affecting fish size (Masse et al. 2006). At the Ulong site the size decrease in parrotfish remains shows that the targeting of inshore taxa was impacting the local marine environment over a long period (**Figure 39**). During the stonework village occupation the abundance of fish species taken increased massively, but in contrast to the Uchularois Cave record the diversity of taxa taken also increased at Ulong with pelagic species of fish and shark captured. Taxa diversity reflects the capture strategies and range of marine environments fished indicating that a range of techniques (angling, netting, trapping, spearing, poisoning) and a wide variety of habitats were exploited by stonework village populations (Masse 1984, 1989; Masse et al. 2006; Clark 2005; Rintaro and Clark in press).

The record of shellfish collection from the Rock Islands evidences similar significant change with the depletion of local stocks of meat yielding clams (Tridacnidae) when people first used the Rock Islands 3100 years ago. With the loss through predation of the easily accessible large clams prehistoric people employed an opportunistic collection strategy focused on the collection of a smaller sized but increasingly diverse group of molluscs. The most abundant species in the Uchularois Cave deposit were *Strombus gibberulus*, *Strombus luhuanus*, and *Nerita* spp. Analysis of these remains demonstrated a significant decline in the size of *Strombus gibberulus* pointing to over-harvesting of the species. This species is an excellent indicator of human marine resource use as it is a common inhabitant of intertidal sandy substrates,

and protected sand and seagrass flats that are present throughout the RISL.

The important findings from Uchularois Cave are outlined by Masse et al. (2006) below:

“These data, when coupled with the previously discussed analyses of fish remains, offer powerful evidence that portions of the marine inshore environment experienced considerable stress seemingly coincident with the stonework village occupation of the Rock Islands. The Rock Islands shell assemblage may exhibit proof of predation pressure from a growing human population, a natural shift in the local environment, changing climatic conditions, or most likely a combination of these factors. Increasing human predation is a logical component of each of the scenarios. In the early period, fewer people ate fewer crabs and other marine invertebrates. In the later period, more people foraged for food and would have a greater likelihood of finding and consuming molluscs and crabs. With fewer crabs in the local ecosystem mollusc populations would endure fewer attacks. The decrease in shell size late in time indicates that human foragers “overharvested”.

Stonework villages in the Rock Islands were underpinned by the collection of lagoon and coral reef resources. Increase in the size of the human population in the Rock Islands placed greater pressure on the marine ecosystem as witnessed by the larger number of fish taken over time and the increasing diversity of marine taxa taken relative to earlier phases. The decline in terrestrial productivity and limited amount of potable water during the LIA made it impossible to sustain permanent occupation, especially when combined with a high frequency of warfare.

3. Adaptation to a precarious environment Comparison with stonework villages on the volcanic islands of Palau

Stonework villages in the Rock Islands differ substantially from those located on volcanic landscapes in their architecture, spatial layout,



Figure 40. Irai stone work village plan. Clark/Reepmeyer – ANU

and the subsistence/resource strategies of their inhabitants. The differences represent a set of unique human adaptations to the marginal environmental conditions of the Rock Islands.

Stonework villages on the volcanic islands were part of a settlement system consisting of a regional system and a village sphere system (Masse et al. 1982). In the regional system there was a distinct center of socio-political power and authority with a series of lower-ranked villages subordinate to the center. The regional systems (polities) and central places at European contact in the late 18th century correspond roughly with the modern state-system of the Republic of Palau.

On the volcanic islands, stonework villages were usually situated several hundred meters from the shoreline on hill slopes or ridges ranging from 10m to 75m above sea level behind a thick band of coastal mangrove (Snyder and Butler 1990). Small freshwater streams flowing into the valley bottoms were used for community water supply and pond field taro cultivation.



Figure 41. Rock Islands stone work village plan. Clark/Reepmeyer – ANU

Stonework village features include stone docks, pathways, sitting platforms, walls, burial platforms, meeting house platforms, standing stones, bathing areas, and wells. **Figure 40** shows the layout of Airai Village as recorded in the 19th century, which has features typical of many stonework villages on Babeldaob. The village is organized around a central structure (bai) that is the nucleus of administrative power. The bai is the symbolic expression of the village and the absence of a center post and interior supports symbolizes the unity of the village (Wickler et al. 2005). Associated with the central structure are the houses of high ranking clans/chiefs. Pathways and causeways radiate out from the central area to stone landing docks, gardening areas, and other dwellings. Alongside the paths are house and burial structures and associated activity areas (Morgan 1988). Canoe docks are connected to the sea by tidal channels that are maintained by cutting the dense mangrove forest. Stone uprights, anthropomorphic and natural, are dispersed

throughout the village area and are often associated with special function structures such as the bai.

Figure 41 outlines the ground-plan of a stonework village in the Rock Islands based on the Mariar stonework remains on Ngeruktabel Island. The differences between the two sets of stone village remains are outlined below. In summary, the differences indicate that the subsistence economy of the Rock Islands was highly specialized on marine foods, while the architectural remains indicate that village social structure was less hierarchical than village systems on volcanic islands.

Defense: Villages located on sand plains in the Rock Islands were exposed to attack from the sea. To counter this threat, defensive walls were built across the seaward side of beach flats. Protective walls guarding trails and paths restricted access to taro gardens in sinkholes and houses/activity areas at higher elevations. On Babeldaob Island the construction of defensive walls was unnecessary as a thick border of coastal mangrove protected stonework villages from seaborne attack.

Central place: On volcanic islands high-status structures were grouped together to form a central place, but on limestone islands chiefly architecture was dispersed with structures built on sand plains, limestone ridge tops, headlands, and interior locations. In general, house platforms and terraces were not organized according to a culturally prescribed ground-plan, as on volcanic islands, but were located according to the constraints of the unpredictable and rugged topography of limestone landscape.

Stone architecture: The stonework remains in the Rock Islands are less formal, smaller in scale, and less diverse than village remains on volcanic islands. Small-to-medium sized terraces and low platforms comprise the majority of stone features in limestone environments and there are relatively few bathing areas, wells, burial areas, stone uprights, canoe docks, or foundations of large community structures such as bai.

Subsistence: Marine food remains are abundant at

stonework village sites in the Rock Islands. Starch crops can only be grown in swampy back beach areas and sinkholes in the interior of the limestone environment. Potable water is scarce in the Rock Islands where rainwater percolates through the porous limestone and emerges in small springs and brackish lenses beneath sand plain sediments. While staples grown on volcanic islands could be traded/exchanged to alleviate shortfalls, the stability of the Rock Island subsistence system was limited by the small amount of freshwater and the dependence on wild foods collected from the marine ecosystem.

The cultural landscape is central to national identity as articulated in traditional history, island place names, and the migration-origin stories of the Palauan people.

The exceptional aesthetic qualities of the Rock Islands are matched by the outstanding cultural significance that the islands have for Palauan people. Comparable landscapes that have associated symbolic, cultural, historical, and religious value include Tongariro National Park (New Zealand), Papahānaumokuākea (United States of America), Rapa Nui National Park (Chile), Kakadu National Park (Australia), and Chief Roi Mata's domain (Vanuatu).

Many Paluans believe that they originate from ancestral settlements in the Rock Islands and subsequently moved to Babeldaob. The Rock Islands were formed when the giant Chuab, who created the first village social structure, was burnt. In falling, Chuab separated Angaur from Peleliu and the giant's body formed all the other islands of the Palau archipelago. Chuab's sibling, Dililebuu, lived on Angaur and named parts of the Rock Islands as she traveled north (e.g., Chesemiich, Iilmalk, Ngebusech in southeast Mecherechar, and Mariar on Ngeruktabel, Nero 1987).

Traditional place names also mention specific cultural sites in the Rock Islands rather than natural landmarks including burial caves, rock art sites, fishing camps, taro gardens, stone money quarries, and ancient village areas. Several sites like the burial cave on Chomedokl Island and rock art site on

Ulong Island (Chelechol ra Ulong) are likely to date back 2000 or more years evidencing an ongoing connection between contemporary Palauans and significant ancestral sites. The establishment of permanent stonework villages from AD 1250-1650/1750 is recalled through the retention of place names originating in abandoned village sites. Migrating groups transferred these old place names to their new village sites. Examples include the association of stonework structures on Uchularois Island with the High Chief Uchermelis ('high chief of the Ngemelis Complex'), the transfer of place names from Ngermiich village on Ngeruktabel to Ngerkebesang Island after village relocation, and the retention of stonework village place names at the abandoned village of Metukeruikull (e.g., Bai era Iechell and Iillebai) on Ngeruktabel Island. Relations between the Rock Island villages and with other parts of Palau are remembered in well-known stories including those about Oreng and Osilek on Ulong Island, the defeat of Ulong by Uchelmelis and Terebkul from Peleliu, and the conflict between Koror and the village of Metukeruikull.

The migration history of Palauans is recorded in traditions about the demise of stonework villages like those on Ulong Island and Ngeruktabel Island. After their defeat at the hands of Ngemelis and Peleliu the people of Ulong Island fled to volcanic Ngerekebesang, where the chief of Ulong had forged an alliance. Other Ulong groups split up, some going to the Babeldaob village of Ngeburech near Melekeok, and others to Ngaremlengui. After a number of years, the Ngaremlengui refugees from Ulong decided to join those at Ngeburech. The large limestone island of Ngeruktabel was depopulated due to warfare with Koror while several Rock Island villages which had assisted Koror were allowed to relocate to Oreor. Both events left tangible remains of their migration in the form of stone remains at former village sites in the Rock Islands and new stone structures on Babeldaob. For instance, because they did not have a sufficiently large money bead to repay their Ngaremlengui hosts for their hospitality, the people of Ulong made payment by repaving the stone paths and platforms of Imeong village prior to leaving for Ngeburech.

An historical connection with ancestral sites in the Rock Islands is also preserved in the retention of chiefly titles brought from the Rock Islands to other parts of Palau. The people of Ngerchemai Village on Oreor used to live in Rock Island villages. After assisting Koror to defeat its enemies in the Rock Islands they were allowed to settle and garden on the fertile volcanic island. The Ngerchemai chiefs kept their former titles preserving the geography of the ancient political structure of the Rock Islands (**Figure 42**). Contemporary cultural activities focusing on the Rock Islands/Southern Lagoon revolve around small-scale fishing and shell fishing, the collection of medicinal and food plants specific to the limestone islands, and hunting coconut crabs and fruit bats. At Oimaderuul Beach on Ngeruktabel Island a stone-lined well has been recently refurbished and swamp taro (*Cyrtosperma chamissonis*) planted in the ancient garden of Ngeremdiu Village. The signage for the site reflects the cultural and natural significance of the Rock Islands to the Palauan people: **“Here remains a symbol of our ancestors’ friendship with nature and neighbours. Not only known for its beauty but also its traditional history and rich culture.”**

Comparison with cultural landscapes in the Pacific Islands thematic study (Smith and Jones 2007)

The Thematic Study of Pacific Island cultural landscapes developed by Smith and Jones (2007) was commissioned to provide comparative data to support the selection of cultural properties for nomination to the World Heritage List. The study gave the first overview of cultural landscapes in the Pacific Islands and had several aims with the most important here being:

To provide comparative data to support the selection of Pacific Island cultural landscapes for nomination to the World Heritage List. (Smith and Jones 2007: 32)

Although introductory in nature and based on published information the Smith and Jones (2007) thematic study of cultural landscapes in the Pacific Islands is the main source of comparative data

to assess the values of cultural sites in the RISL. The thematic study identified key social and cultural practices within the Organically evolved cultural landscape (*Operational Guidelines Annex 3*, paragraph 10, category ii) that are:

'... primary factors influencing the creation and patterning of Pacific cultural landscapes in the past and present, namely, traditional horticulture and agriculture, systems of land tenure and settlement patterns.' (Smith and Jones 2007: 32)

The cultural landscapes portfolio in the 2007 thematic study has 22 cultural landscapes which were listed as Organically evolved/Associative and identified further to one or more relevant themes. The cultural landscape site list is weighted toward those in Polynesia due to a paucity of information for many sites in the Western Pacific (Smith and Jones 2007:64). Three cultural landscapes are listed in the geo-cultural region of Micronesia; Bikini Atoll (Marshall Islands), Babeldaob hill terraces (earthworks) and traditional (stonework) village settlements (Palau) and Line Islands (Republic of Kiribati). The cultural values of the RISL have been compared above to the Babeldaob earthworks and traditional village sites while the Bikini Atoll site is not comparable as it represents significant elements of 20th century colonial history such as Cold War imperialism, forced population movement and thermonuclear tests.

The cultural sites of the Line Islands are located on atolls and raised reef islands and comprise a relict landscape as the landmasses were uninhabited at the time of European arrival in the late 18th century. Although the Line Islands are marginal environments for human settlement the cultural remains differ from those of the RISL in key respects. First, the cultural remains of the Line Islands derive from Polynesian settlement and are not representative of human occupation in the Micronesia geo-cultural region. Second, the cultural remains in the Line Islands are sparse and probably result from short term visits during a phase of open-ocean Polynesian voyaging around AD 1200-1400. In contrast, the stonework villages in the RISL represent the authentic remains of a traditional

Micronesian settlement system. Third, the cultural values of the RISL are bolstered by detailed records of marine resource use and traditional history that are not available for prehistoric cultural sites in the Line Islands (Anderson et al. 2000).

The cultural landscapes in the Polynesian and Melanesian regions of the Pacific that are most comparable to the cultural sites in the RISL have themes involving *environmental restrictions and catastrophe, environmental change, settlement pattern, seascape and social organisation*. Terrestrial subsistence is represented by the themes of *horticulture, plant domestication, arboriculture and tree crop selection/domestication* at North Kohala (Hawaii, USA), Mangaia (Cook Islands, NZ), Bay of Islands (NZ), Reef/Santa Cruz Islands (Solomon Islands) and Kuk (Papua New Guinea). Terrestrial subsistence is not a significant theme in the RISL where the population was dependent on the collection of marine foods and the cultural landscapes of these properties include relict field systems and the remains of human behaviour that are not comparable to those found in cultural sites in the RISL.

Rapa Nui (Chile), Rapa (French Polynesia) and Sigatoka dunes and Sigatoka valley (Fiji) are all similar to the RISL in having organically evolved relict cultural landscapes involving environmental change/restriction/catastrophe. The landforms are very different to the limestone islands in the RISL as Rapa Nui and Rapa are young volcanic islands and the Sigatoka dunes and valley are part of the complex Fiji platform (Vitiaz arc structure). Culturally, the first two properties are in Polynesia and Fiji is traditionally grouped within Melanesia. The impressive monumental architecture of Rapa Nui consists of raised platform (*ahu*) and ancestor stature (*moai*), the main cultural sites of Rapa are prehistoric hill fortifications (*pare*) while at Sigatoka there are sites covering the full sequence of human occupation starting at 2900 years ago with late prehistoric fortifications dominant in the 2nd millennium AD. Pacific islands of volcanic and continental origin had greater subsistence potential for colonising humans especially in relation to the production of starchy crops. However, the ability of

horticulture to sustain population growth created human-induced environmental change that was the primary driver affecting the cultural landscape.

The monumental architecture of Rapa Nui and fortification on Rapa and in the Sigatoka valley are territorial responses to increasing social competition under competition and in the case of Rapa Nui and Rapa, relative island isolation and limited opportunities to alleviate stress through migration. The cultural landscape of the RISL contrasts with these examples as it resulted from an initial occupation of a precarious environment and the marginal nature of human tenure in these islands illustrates clearly the challenges and limits of the prehistoric social system, particularly under climate change. Rather than invest in territorial responses such as the creation of monumental architecture and substantial fortifications the population of the RISL village system were compelled to migrate by declining yields of marine foods from over-harvesting in tandem with fresh water shortages as a result of drought and reduced precipitation from the southward movement of the Intertropical Convergence Zone during the Little Ice Age.

Whereas investment in territorial strategies in the Pacific tends to create highly visible and modified cultural landscapes from constructions such as monuments and forts the alternative strategy of

population dispersal and migration is integral to the initial colonisation and subsequent patterning of human diversity throughout Oceania. The cultural sites of the RISL are the exceptional example in the tropical Pacific of a significant, but poorly represented human responses to environmental stress in island environments, particularly those of Micronesia, namely, migration and landscape abandonment.

Settlement patterns/social organisation/seascapes are a key theme for 13 cultural landscapes in the thematic study. The majority of these are associative/organically evolved relict landscapes (n=10). Prehistoric stone structures are a component in many of these landscapes such as Rapa Nui, Papahānaumokuākea Marine National Monument, Taputapuātea, Opunohu Valley, Mangaia, Atoll marae and Line Islands. Earthworks/earth features that are not directly comparable to the stonework village sites in the RISL are prominent at North Kohala, Rapa, Bay of Islands, North Taranaki fortified landscape, Sigatoka valley (fortifications), Kuk and the Babeldaob hill terraces.

In most parts of the Pacific, stonework structures representing the settlement pattern/social organization frequently derive from social events following European contact and are relicts of the changes wrought by the institution of colonial/Euro-American relations. For example, the settlement system of Samoa prior to European and missionary influence consisted of clustered household units represented by stone foundations that stretched far inland, but the settlement pattern changed in the 19th century following the introduction of trade goods, Christianity and increased mortality from warfare and effects of introduced diseases (Clark and Martinsson-Wallin 2007). As a result, the settlement pattern became coastal and chiefly stone architecture such as pigeon-snaring mounds, large platforms and ceremonial *ti* ovens were no longer built. An additional change to traditional social systems and settlement patterns in the Pacific was the trend toward centralized political authority that occurred in the post-contact era as happened in Hawaii, Tahiti, Palau, New Zealand and Fiji.

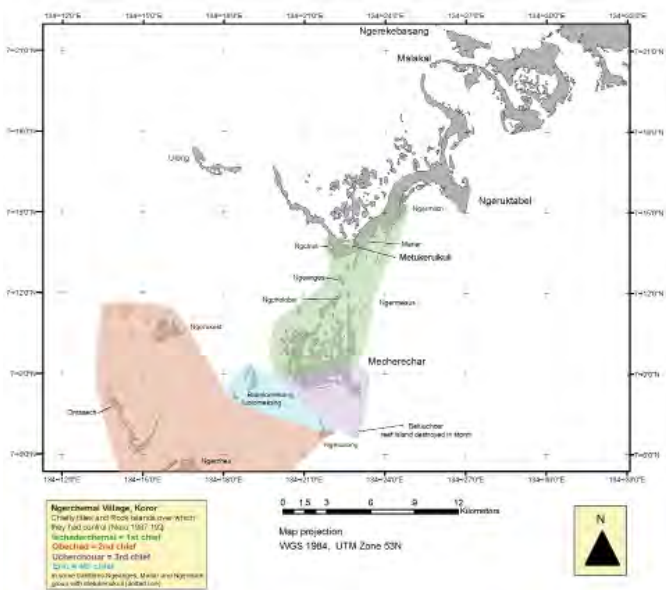


Figure 42. Ancient Rock Island titles and islands. Clark/Reepmeyer – ANU

Table 7. Comparative Analysis of the RISL and other comparable World Heritage Sites

UNESCO World Heritage Property	Total Area (ha)	WH Criteria	Marine Lakes	Bird Species	Fish Species	Coral Species
Rock Islands Southern Lagoon, Palau (Proposed) ^{1,2,3,4, 14}	85,900 (94% marine)	iii,v,vii,ix,x	52	56	746	385
Ha Long Bay, Vietnam ^{1,5,15}	150,000 (Percent marine N/A)	i,iii	47	200	400	232
East Rennell, Solomon Islands ^{1,6}	37,000 plus marine	ix	1	43	759 (island Complex)	300 (island Complex)
Lagoons of New Caledonia, France ^{1,6,*}	1,574,300 (100% marine)	vii,viii,ix,x	0	105	1695	510
Great Barrier Reef, Australia ^{1,6,*}	34,870,000 (95% marine)	vii,viii,ix,x	0	242	1500	400
Tubbataha Reef, Phillipines ^{1,6}	33,200 (99% marine)	vii,ix,x	0	46	441	396
Shark Bay, Western Australia ^{1,6,7,8,*}	2,197,300 (70% marine)	vii,viii,ix,x	0	230	323	95
Belize Barrier Reef, Belize ^{1,6,*}	96,300 (50% marine)	vii,ix,x	0	187	500	100
Cocos National Park, Costa Rica ^{1,6,*}	199,970 (97% marine)	ix, x	0	87	300	32
Phoenix Islands, Kiribati ^{1,9,*}	40,825,000 (Percent marine N/A)	vii, ix	0	44	500	200
Galapagos Islands, Ecuador ^{1,6,*}	14,066,514 (95% marine)	vii,viii,ix,x	0	57	460	120
Sian Ka'an, Mexico ^{1,6,*}	528,000 (23% marine)	vii,x	0	339	175	83
Coiba National Park, Panama ^{1,6,10,*}	270,125 (50% marine)	ix,x	0	147	760	58
Aldabra Atoll, Seychelles ^{1,6,11,*}	35,000 (41% marine)	vii,ix,x	0	65	287	210
Soctora, Yemen ^{1,6, 12,*}	410,460 (32% marine)	x	0	192	730	283
Papahānaumokuākea, USA ^{1,13,*}	36,207,499 (99% marine)	iii,vi,viii,ix,x	0	68	258	57

1. Coral Reef Research Foundation 2010

2. Pratt and Etpison 2008

3. Winterbottom 2004

4. Maragos 1994

5. United Nations Environment Programme, World Heritage Monitoring Centre 2008

6. IUCN Technical Evaluation: The Lagoons of New Caledonia: Reef diversity and associated ecosystems (France)_id no.1115

7. Data obtained from Shark Bay Information site at: <http://www.sharkbay.org>

8. Data obtained from UNESCO World Heritage List nomination dossier for Shark Bay, Australia

9. Data obtained from UNESCO World Heritage List nomination dossier for the Phoenix Islands, Kiribati

10. Data obtained from UNESCO World Heritage List brief description of Coriba National Park

11. Data obtained from UNESCO World Heritage List brief description of Aldabra Atoll, Seychelles

12. Data obtained from UNESCO World Heritage List brief description of Soctora, Yemen

13. Data obtained from UNESCO World Heritage List nomination dossier for Papahānaumokuākea, USA

14. Michael N. Dawson, personal communication, 2010

15. Sharon Patris, personal communication, 2011

* Using the definition of lakes as "small bodies of seawater entirely surrounded by land" (Dawson and Hamner 2005), no marine lakes were identified for these sites.

Thus, many stonework settlements in the Pacific cultural landscapes thematic study result from the diverse consequences of recent culture contact with landscape abandonment primarily the result of ideological and political change that reduced, at least for a period, the religious and political importance of many sites. This contrasts with the RISL where stonework villages were settled relatively early at AD 1000 and the landscape was abandoned at AD 1400-1500, several centuries before European arrival at AD 1783. The cultural landscapes of the RISL result from a very different set of historical processes, which distinguishes the stonework villages and associated remains of marine resource exploitation from all other cultural landscapes in the Pacific.

Comparative Analysis – Natural Heritage Sites

The Rock Islands Southern Lagoon, while relatively small and found outside of the Coral Triangle, has extremely high diversity within its boundaries. The property is unique as it combines features that are represented in several inscribed sites, such as the rock island landscape and marine lakes presented in Ha Long Bay, Vietnam, and the diversity of marine habitats found in the Great Barrier Reef of Australia, Lagoons of New Caledonia, Tubbataha Reef in the Philippines, and East Rennell in Solomon Islands. In one visit to the RISL, it is possible to see many species and habitats that are only found collectively at other World Heritage sites, including rock islands, marine lakes, fringing reefs, barrier reefs, patch reef, sand flats, mangroves, seagrass beds, and deep water lagoons, as well as unique marine organisms such as sea turtles, dugongs, manta rays, several species of shark, and endemic terrestrial fauna. These natural features form the basis of Palauan cultural and are found alongside many cultural and historical sites. Among World Heritage sites with comparable natural heritage features, the RISL and Papahānaumokuākea are the only mixed sites.

As demonstrated in **Table 7**, which is adapted from Table 2 in the IUCN Technical Evaluation of the Lagoons of New Caledonia (IUCN 2008), the RISL of Koror has the highest number of marine lakes among comparable marine sites and among

the highest number of fish and corals per unit area. Fish and coral surveys referenced in **Table 7** summarized the number of species found in all of Palau, and were not analyzed for the RISL alone when they were prepared. Preliminary data indicate that the numbers of fish and corals in the RISL may be higher than listed in **Table 7**. There may be at least 1,000 species of fish in the RISL (P. Colin, pers. comm.).

Similar areas of karstic islands and marine lakes are found in Vietnam's Ha Long Bay, in the Raja Ampat region of West Papua, and in the Berau region of East Kalimantan in Indonesia. The latter has only four marine lakes within a marine protected area of 11,655km².

Ha Long Bay, only part of which is a World Heritage Site, has 47 marine lakes (S. Patris, pers. comm. 2011) in its World Heritage Site, an area of 150,000ha (WHC Nomination Documentation 2000). Only one marine lake is known to have *Mastigias* jellyfish present, likely the lagoon form thus not a unique subspecies, and even then, only seasonally (Cerrano et al. 2006). The RISL has 52 marine lakes in an area of 85,900ha.

The RISL is comparable to the Ha Long Bay World Heritage Site. The striking difference between the two is the absence of a barrier reef in Vietnam and an extensive barrier reef system in Palau. Within an area of 150,000ha Ha Long Bay contains 400 species of fish while the RISL, with an area of 85,900ha, contains 746 species of fish. Ha Long Bay has a resident fishing community population of 1,600 while the RISL has no resident population. Tourism in Ha Long Bay, with over 1.7 million visitors in 2002, has had major negative impacts on the ecosystem through tourist development and activities (WCMC 2008). The RISL has controlled tourism activity with the maximum number of documented visitors reaching 80,000 in 2007.

In Raja Ampat, there are more than 40 marine lakes in over 50,000km². Recently, marine scientists from the Coral Reef Research Foundation (CRRF) visited 13 of the marine lakes in the central Raja

Ampat islands, including Gam and Mansuar. They noted that, compared to Palau's marine lakes, physical diversity was low suggesting less overall diversity in lake types. Most lakes were shallow and well connected to the lagoon, many, appearing to be true marine lakes from satellite photos, were actually coves, and, despite extensive survey, only one meromictic lake (containing no jellyfish) was encountered. Marine lakes also occur in Raja Ampat's northwest (the Wayag Island group) and southeast (Misool Island), and likely on Waigeo Island, however, their numbers are unknown. Within Raja Ampat, the *Mastigias* sp. jellyfish has been identified in only one marine lake thus far (<http://www.misoolecoresort.com/newsAugust2007.html>; Dawson et al. 2009).

Koror State law closes all but one of the RISL's marine lakes to recreational human use in order to deter detrimental human activities, such as fishing and aquaculture development, in them. Thus Palau's marine lakes, still in their pristine condition, remain a natural laboratory for studying evolution. In stark contrast, there is aquaculture development in at least one marine lake in Ha Long Bay (Cerrano et al. 2006) and logging around the perimeter of at least two marine lakes in Raja Ampat (CRRF, per. comm. 2010). While Ha Long Bay and Raja Ampat boast abundant marine lakes in large areas, the RISL, in its area of 859km², has the highest density, most diverse collection, and best documented marine lakes (e.g., Hamner and Hauri 1981; Hamner 1982; Hamner et al. 1982; Hamner and Hamner 1998; Dawson and Hamner 2003; Dawson and Hamner 2005; Dawson 2005a; Martin et al. 2005; Patris et al. 2010).

The size of the Rock Islands Southern Lagoon area of Koror State is smaller (85,900ha) than the Great Barrier Reef (34,870,000ha) but its marine species richness is comparable. The Property has some of the most diverse marine environments packed into a relatively small area (Golbuu 2000).

Other World Heritage-listed properties such as Aldabra, East Rennell, and Henderson Islands are raised atolls. Of all these sites only East Rennell has a brackish water lake. This lake, the largest body

of enclosed water in the insular Pacific, had far fewer endemic species than the lakes in the RISL (Hamilton-Smith 2007).

The Rock Islands Southern Lagoon is considered one of the most diverse and intact coral reef areas in Palau and in Micronesia. Overfishing of selected customary fish and invertebrate species is a concern within the RISL, but fish and invertebrate populations are still in good condition. The population of Palau is relatively small (ca. 20,000), therefore anthropogenic pressure on harvesting of marine resources is probably lower than other existing marine sites on the World Heritage List. Moreover, since the relatively small RISL is owned and managed by a single State Government, its management has fewer constraints compared to the Great Barrier Reef and the Lagoons of New Caledonia. Furthermore, a recent study by Wolanski and De'ath (2005) indicates that the health of the Great Barrier Reef has been negatively impacted by land-use which has resulted in the input of nutrients and fine sediment. Mining in New Caledonia is a threat to the lagoons, and has resulted in the introduction of terrigenous materials to the coral reef (Fernandez et al. 2006).

3.d Authenticity and/or Integrity

Cultural Sites

The network of Rock Island village remains dating to AD 1200-1650 consist of stonework architecture and subsurface deposits that are substantially intact. The village sites are integral to Palau's traditional history and comprise a significant archive of cultural and scientific information that details the delicate relationship between people and the climate-ecosystem in a marginal environment. The excellent preservation conditions on limestone islands have maintained a range of sites not found elsewhere in the archipelago, including human burial sites, rock art, stone money quarries, and cultural deposits dating back 3000 years.

Several factors have impacted parts of prehistoric sites, but the majority of Rock Islands, particularly those south of Malakal, are relatively pristine not having experienced modern residential or

commercial development. The islands today are typically visited only for short periods by both Palauans and tourists. The nearby volcanic islands function as the population and visitor hubs for these Rock Island excursions. Those islands which have well-known natural attractions (Jellyfish Lake on Mecherchar) or are associated with internationally known dive sites (Ulong Channel, Blue Hole) are likely to have higher visitor numbers and potentially greater impacts on their cultural sites.

Major barriers to future development of the limestone islands are the scarcity of drinking water, the small number of locations suitable for construction and infrastructure projects, and Koror State's comprehensive management plan which controls the number of tourists or visitors entering the RISL and their activities. The Koror State Legislature has zoned all of the Rock Islands as a "Conservation" Zone (Koror State Public Law No. K6-100B-99). More recently, the passage of Koror State Public Law No. K9-222-2010 prohibits any permanent construction or development in the Rock Islands (other than tourist related facilities). Any change to the existing Southern Lagoon management has the potential to increase development in the Rock Islands either through island-specific commercial projects or by the creeping penetration of modernity from populated areas adjacent to the proposed Property boundary.

Since the end of WWII, sparse intervention at Rock Island sites includes infrequent placement of information signage, construction of low-impact visitor structures, and occasional vegetation clearance at several accessible locations. Archaeological investigations have removed artifacts and food remains from sites on Ngeruktabel, Ngeanges, Dmasech, Uchularois, and Ulong. Excavation units were infilled and the cultural materials are curated at the Belau National Museum (BNM), Southern Illinois University (SIU), and Australian National University (ANU). Most prehistoric Rock Island sites have not been deliberately targeted for their remains. Tourist operators report that, despite the threat of penalties legislated in National Title 19, the Cultural Resources bill, two site types—burial caves/

chambers and Yapese stone money quarries—have occasionally been looted. Residents and tourists have removed intact traditional pottery vessels and shell artifacts from burial caves and pieces of stone money from Yapese quarry sites. Anecdotal sources indicate that some souveniring of historic WWII items occurs in the RISL. Sensitive burial caves and fragile rock art sites were visited by tourists in the past, but this practice has been discouraged by Koror State and Koror's traditional chiefs. Koror State Rangers patrol the RISL to ensure the laws are adhered to, and without a rope ladder it is extremely difficult to scale the cliff to most of the rock art sites. There is currently no commercial market for prehistoric items such as the adzes, shell ornaments, and traditional pottery that are commonly found in the Rock Islands.

Cultural Sites: Authenticity

The relict landscape of stonework villages in the Rock Islands is a highly authentic example of an extinct settlement system. As demonstrated by historical, traditional, and archaeological records, the Rock Island stonework structures and settlements date to the pre-European era. An early survey map of Palau made in 1792 by Captain John McCluer did not report any villages in the RISL, and in 1783 the crew of the *Antelope* noted that only one Rock Island was settled. Described as lying between Ulong and Peleliu, the island is most likely Ngercheu (Carp Island), but could be an island in the Ngemelis Complex, which traditions say was occupied by survivors from Ngeruangel atoll around AD 1700. Radiocarbon dating of stonework villages shows widespread occupation after AD 1000 with declining human settlement and final island abandonment around AD 1650-1750.

Traditional history substantiates the authenticity of a unique prehistoric settlement pattern made up of individual stonework villages that were ranked within a larger regional system and headed by a high-status village led by the paramount chief. The structure of this ancient socio-political pattern was preserved during the migration of the Rock Island residents to the volcanic islands. For example, when the inhabitants of the Rock Island village of Ngerchemai were allowed to settle on Oreor

Table 8. Chiefly titles and associated islands.

Chiefly title	Rank	Islands
Iechaderchemai	1st	Mecherechar, Ngchelobel, Ngorblobang, Ngermeaus, Ngeruktabel (Mariar, Ngchus, Ngermiich)
Obechad	2nd	Ngerchong (half), Ngemelis, Ngerukeuid, Ngercheu, Ngedebus
Ucherchouar	3rd	Beluchoar, Metukercheuas (southern Mecherchar)
Eriu	4th	Ngerchong (half), Babelomekang, Eoulomekang

in exchange for their assistance in helping Koror to overcome Ngeruktabel Island, the Ngerchemai chiefs kept their titles and relative rank (**Table 8; Figure 42**).

The regional system was hierarchical with lower ranked villages owing tribute and allegiance to the paramount village (*Klou el beluu*). Demands from the head village for food, artifacts, women, and weapons from subject villages were a constant source of inter-group friction. The defensive aspect of Rock Island villages can be seen in the strategic placement of stone walls across beaches and trails leading to inhabited areas, the difficulty in accessing platforms and terraces deliberately positioned high up in the karstic terrain, and the frequency of observation points on high ridges and peaks. These structures highlight the presence of endemic conflict. The formation of ranked multi-village units in the Rock Islands allowed communities to make full use of the widespread marine resources within the RISL and to defend their settlements when attacked by another district polity (*renge*).

The socio-political arrangement of the stonework village system clearly illustrates the environmental and cultural tensions faced by people living in a marginal environment. The political hierarchy of villages bound the communities together so that the subsistence and defensive needs of dispersed communities could be met. Episodes of water and food shortage as a result of drought, the over-harvesting of natural foods, population increase, warfare, and mounting tribute demands, however, produced instability in the regional system eventually resulting in high rates of migration out of the Rock Islands.

In addition to the stonework villages on Ulong, Ngemelis, Ngeruktabel, Ngeanges, and

Mecherechar, significant Rock Islands sites with a high degree of authenticity include a major rock art complex and an AD 1783 culture contact site on Ulong Island, prehistoric burial caves, and Yapese stone money quarries.

Cultural Sites: Integrity

A variety of human and natural factors have influenced the integrity of prehistoric sites in the Rock Islands over different time scales. Comparison of detailed site survey records made in the 1980s by the SIU investigations (Masse et al. 1982; Masse 1984) with information collected by ANU archaeologists in 2010 for this World Heritage nomination dossier provides an almost three-decade long dataset about the major factors affecting site integrity in the Rock Islands. Overall, prehistoric sites on sand plains, where coastal erosion and human activity have been greatest, display less integrity than cultural sites located in the rugged limestone terrain that lie out of reach of the sea and which are less visited by people.

Much of the integrity of the cultural sites is ensured through a combination of National and State environmental and cultural preservation laws, some of which have resulted in the complete closure of areas of the RISL to both Palauans and visitors, their limited accessibility due to the need for a boat to reach them, and the rugged karst terrain. Furthermore, construction of visitor facilities or commercial development, as well as scientific investigations by visiting scholars requires permits from the Bureau of Arts and Culture which is tasked to protect and manage Palau's cultural heritage.

Specific factors resulting in negative impacts to the sites include tree growth and collapse, microbiological and organic activity, megapode

nests, land crabs, wave action, tourist-visitor facilities, vandalism, short-term recreational use, and WWII defensive features. Prominent results of the impacts are the loss of structural integrity of the stonework features and the mixing and deflation of stratified cultural deposits.

Tree growth and collapse

Large tropical trees and shrubs generally have a life-span of less than 100 years. The roots of common coastal species such as *Calophyllum inophyllum* (btaches), *Barringtonia asiatica* (bdul), and *Artocarpus mariannensis* (chebiei) infiltrate stonework structures and soft sediments containing prehistoric deposits. Growth of the infiltrating tree leads to structure displacement and deterioration. Over several hundred years the cycle of tree growth, death, and collapse displaces large amounts of prehistoric material that is held in the root mass.

Microbiological and organic activity

Rock art on sheltered or exposed limestone is subject to biodeterioration due to bacteria, fungi, algae, and lichens. These organisms alter the composition of the substrate and chemically erode both it and the prehistoric art. The organic humic acids formed during the breakdown of vegetation chemically erode calcium carbonate. Organic acids are produced in shallow subsurface contexts containing large amounts of late prehistoric marine shellfish remains. Over time these acids can dissolve substantial parts of these shellfish assemblages.

Megapode nests

The Micronesian megapode (*Megapodius laperouse senex*) is commonly found on several Rock Islands nesting on sand plains that contain prehistoric deposits. The megapode builds large mound nests of sand and forest litter that use heat generated by the decomposing vegetation to incubate their eggs. Nest mounds can reach large dimensions (mean size=6.2m x 7.3m x 1.1m) and incorporate a substantial number of prehistoric artifacts (Wiles and Conry 2001).

Land crabs

Land crabs commonly burrow through moist sand plain sediments, especially in the Rock Islands

where there is no resident human population to control their number. The actions of these crabs over long periods redistribute smaller cultural remains through the sediment column.

Wave action

Wave action on sea and coastal prehistoric sites causes degradation to humanly constructed structures and the displacement or removal of cultural and natural deposits. The effects of wave action have been enhanced in Palau as the archipelago is subsiding at a reasonable rate (0.6mm/year). Past and present wave surges (higher than average tides), changing sea levels, and tropical storms have negatively impacted prehistoric sites. Wave wash during severe storms typically follows the interface between the island bedrock substrate and the sand plain and can redeposit prehistoric remains. Located close to the sea, traditional stone features related to canoeing or fishing—stone docks, piers, resting platforms, and canoe houses—are at heightened risk from the destructive effects of wave action.

The combination of island subsidence and rising sea levels from global warming has the potential to destroy many significant Rock Island cultural properties. Those sites most at threat should be monitored, and investigated if inundation appears likely to ensure their valuable data is not lost.

Visitor facilities

Visitor facilities are often located adjacent to prehistoric remains, particularly stonework villages, due to the limited availability (past and present) of suitable shoreline access points. Some historically constructed shelters and amenity facilities have disturbed or destroyed traditional features by incorporating stones from or disassembling the ancient stonework. Construction often results in uncovering midden deposits and prehistoric human remains (Masse et al. 1982).

Fossicking, vandalism and graffiti

Most prehistoric sites show evidence of visitors causing some damage through fossicking or vandalism. Subsurface cultural deposits and stonework features have not apparently been

deliberately targeted but artifacts have been removed from limestone caves and Yapese stone money sites.

Short-term camps/visits

The Rock Islands are extensively visited for fishing and recreation by Palauans and tourists. The building of short-term, temporary fireplaces and other camp structures commonly makes use of stone found in nearby traditional features and the digging of toilets, rubbish pits, and post holes has displaced sediments with prehistoric materials.

WWII Japanese defenses

During, and prior to, World War II there was substantial Japanese activity in the Rock Islands, especially on Ngeruktabel Island, in the form of offensive gun positions, roads, temporary and permanent shelters, lookout positions, lighthouses, and defensive bunkers and earth positions. Although Japanese construction created an important historical landscape representing the major global conflict of the 20th century, it also impacted the integrity of several prehistoric sites.

Natural Heritage: Integrity

The RISL includes a healthy and diverse terrestrial ecosystem that includes limestone forests, strand forests, mangroves, and hundreds of species of terrestrial flora and fauna. All of Palau's endemic bird species are found with the RISL as well as the critically endangered *Ponapea* palm. Limited access due to steep, often vertical, slopes and rugged terrain has resulted in the RISL's limestone forests being

one of the least disturbed forests in the Pacific. Impacts to the RISL's terrestrial ecosystems are reduced by strict regulations on the harvesting of trees (only for cultural and traditional purposes) and permit requirements for collection of terrestrial specimens. Marine habitats and organisms are well represented and other than loss during ENSO events, there have been no other anthropogenically-influenced habitat losses in the RISL.

The complete closure of the Ngerukewid Island Wildlife Preserve maintains the integrity of its natural ecosystems. Coral reefs in the RISL have showed more rapid recovery after intense bleaching events in 1998 than other areas in Palau (Golbuu et al. 2007a). This indicates that the system has retained its natural resilience despite human use.

The Property operates under the Rock Islands Southern Lagoon Area Management Plan 2004-2008, which is currently being revised. Koror State has committed to regular revisions to be able to respond to new threats.

The RISL is considered one of the underwater wonders of the world. Ninety percent of dive sites in Palau are in the RISL of Koror. Visitors to Palau have doubled from over 50,000 in 2000 to over 100,000 in 2011. As detailed in Section 5.h, these tourists visit multiple destinations in the RISL. The current management strategy limits visitors to a small number of delineated areas within the RISL. This enables the management team to effectively monitor and adapt management activities.



Manta Rays seen from the air. Photo by Mandy Etpison.

4a. State of Conservation

The RISL is well managed to keep its cultural and natural heritage in a near pristine state. The RISL is managed according to the Rock Islands Southern Lagoon Area Management Plan 2004-2008, passed in 2005 and currently under review. Several factors contribute to the RISL's superb conservation state:

- A comprehensive Management Plan that is certified by law and which has community support;
- Protection at the national, state, and traditional levels that prohibit taking of key species and artifacts, and disturbing archaeological sites;
- No permanent inhabitants and only short-term visitors;
- The knowledge that RISL tourism is key to Palau's economy.

Present state of Cultural Heritage Conservation

The 2010 survey examined several archaeological sites in the Rock Islands, adding to the initial survey data collected in 2009. The sites visited include stonework villages, Yapese stone money quarries, a burial cave, and a rock art site. A variety of human and natural factors has influenced the preservation of Rock Island prehistoric sites. Specific examples of these impacts as recorded in field survey are summarized below.

Although representative sites identifying the distinct artifactual remains, human behaviors, and set of environmental interactions in the Rock Islands' culture sequence are recorded, many cultural sites in the RISL have yet to be documented. A complete inventory of cultural sites is a priority for the Rock Islands. **Table 9** gives an inventory of known cultural sites as found in the published literature. Unfortunately, the annual archaeological survey of

one of Palau's 16 states by the Bureau of Arts and Culture (modeled after a U.S. Historic Preservation Office) has yet to include the Rock Islands. The Bureau's priority has been on the large volcanic island of Babeldaob due to the imminent threat of development rather than on the Rock Islands which are largely protected from development and are highly prized in their natural state as economically important tourism sites. The 2010 survey showed that the overall preservation of prehistoric sites was generally lower on the sand plains, where coastal erosion and human activity have been the greatest, compared to sites and features in limestone terrain that lie out of reach of the sea and are less visited.

Dmasech and Uchularois

On Dmasech Island the stonework village features display substantial variation in their preservation. Stone features on the eastern beach flat are poorly preserved compared to stone features on the ridgeline. Exceptions are the large F-5A and F-18 features at Beluu Ngemelis (**Figure 16**).

There were several megapode mounds containing archaeological remains of pottery and food shell on the sand plain east of the limestone ridge (**Figure 43**). The depth to which megapodes have disturbed the subsurface cultural deposits is not known.

Several stone features and midden remains on the beach flat of Uchularois Island were removed during the construction of the tourist/visitor structure in the 1970s and 1980s. Extensive deposits of marine shell and pottery recorded around the base of Uchularois in the 1950s (Osborne 1966) had almost entirely disappeared by wave action in 2010 with only a few water-rolled pot sherds present in the intertidal zone.

Table 9. Inventory of cultural sites in the Rock Island Southern Lagoon identified in the published literature.

Island	Type	Site No.*	Site No.^	Reference
Koror Island (Omis Cave)	Yapese stone money quarry	B:OR-1:35	na	Fitzpatrick 2003
Koror Island (Ngermidichum)	rock art site - two paintings	-	na	McKnight 1964
Koror Island (Ucheliungs cave)	burial cave	B:OR-14:8		Berger et al. 208
Ulebsechel Island (Oimad er Merach)	rock art site - small group of paintings	B:OR-14	-	McKnight 1964
Ulebsechel Island	small cave, dock, trail, rock art on cliff ledge	B:OR-14	Alup 1	Osborne 1966
Ulebsechel Island	surface sherds	B:OR-14	Alup 2	Osborne 1966
Ulebsechel Island	surface sherds	B:OR-14	Alup 3	Osborne 1966
Ulong Island	stone features and midden	B:OR-15:5	AU 1, B:OR:20	Osborne 1966; Snyder and Butler 1997; Clark 2005
Ulong Island	stone platforms/terraces	B:OR-15:8	AU 2	Osborne 1966
Ulong Island	coral paving, walls, trails and terracing	B:OR-15:7	AU 3	Osborne 1966
Ulong Island	rock art site	B:OR-15:6	AU 4, B:OR:21	McKnight 1964; Osborne 1966; Snyder and Butler 1997
Mecherchar Island (Ngeruauach)	midden deposit	B:OR-16:1	Mr1	Osborne 1966
Mecherchar Island	midden deposit and stone features	B:OR-16:2	Mr 2	Osborne 1966
Mecherchar Island (Eil Malk)	burial cave and midden deposit	B:OR-16:3	Mr 3	Osborne 1966
Mecherchar Island (Ngebusch-Ngerblobang)	rock shelters, midden deposits, stone features and garden sites	B:OR-16:4	Mr 4	Osborne 1966
Mecherchar Island (Ngeregong)	midden deposit	B:OR-16	-	Osborne 1966
Ngeruktabel Island (Metukerukull village)	stonework and midden deposit	B:OR-15:1	Ngurk 1A, OR-12	Osborne 1966; Liston 2011
Ngeruktabel Island	stone terraces	B:OR-15	Ngurk 1B	Osborne 1966
Ngeruktabel Island	stone features on ridges with associated midden	B:OR-15	Ngurk 1C	Osborne 1966
Ngeruktabel Island (Taberrakl)	rock art, pottery	B:OR-15:3	Ngurk 2	Osborne 1966
Ngeruktabel Island	stone features and midden deposit	B:OR-15	Ngurk 3	Osborne 1966
Ngeruktabel Island	stone features and midden deposit	B:OR-15	Ngurk 4, B:OR:11, PANT 3	Osborne 1966
Ngeruktabel Island	stone features and midden deposit	B:OR-15:14-17	Ngurk 6	Osborne 1966
Ngeruktabel Island	unspecified occupation material	B:OR-15:11	Ngurk 7	Osborne 1966
Ngeruktabel Island	stone features and midden	B:OR-15:10	Ngurk 8	Osborne 1966
Ngeruktabel Island	historic WWII site Japanese lighthouse, gun emplacements abandoned large guns	B:OR-15	-	Osborne 1966
Ngeruktabel Island	Yapese stone money quarry, on road to lighthouse	B:OR-15	-	Osborne 1966

Table 9. Inventory of cultural sites in the Rock Island Southern Lagoon identified in the published literature. (continuation)

Island	Type	Site No.*	Site No.^	Reference
Ngeruktabel Island (Mariar)	stone features and midden	B:OR-15:8	Eil re Rechiklau 1, B:OR:11	Masse 1984; Snyder and Butler 1997
Ngeanges Island	midden deposit	B:OR-16:6	Ngeyanges 1, B:OR:14	Masse 1984
Ngeanges Island	midden deposit	B:OR-16:7	Ngeyanges 1, B:OR:15	Masse 1984
Ngeanges Island	stone platforms	B:OR-16:8	Ngeyanges 1, B:OR:16	Masse 1984; Snyder and Butler 1997
Ngeanges Island	stone features and midden	B:OR-16:9	Ngeyanges 1, B:OR:22	Masse 1984
Chomedokl Island (Omedokl Cave)	burial cave (Eil ra Rechiklau)	B:OR-15:18		Berger et al. 2008
Dmasech Island (Tmasch)	stone features and midden	B:OR-17:1	B:OR:1	Masse 1984
Dmasech Island (Beluu Ngemelis)	stone features and midden	B:OR-17:2	B:OR:2	Masse 1984
Uchularois Island (Rois)	stone features and midden	B:OR-17:3	B:OR:3	Masse 1984
Dmasech Island (Belualakelot)	surface sherds	B:OR-17:4	B:OR:4	Masse 1984
Dmasech Island	stone features and midden	B:OR-17:5	B:OR:5	Masse 1984; Snyder and Butler 1997
Dmasech Island (Beluu Ngemelis)	stone features and midden	B:OR-17:6	B:OR:6	Masse 1984
Dmasech Island	stone features and midden	B:OR-17:7	B:OR:7	Masse 1984
Dmasech Island (Ikulauol)	stone features and midden	B:OR-17:8	B:OR:8	Masse 1984
Cheleu Island	possible stonework village	B:OR-17:9	B:OR:9	Masse 1984
Uchularois Island (Uchularois cave)	midden deposit	B:OR-17:10	Ngem 2, B:OR:10	Masse 1984
Dmasech Island	stone features and midden	B:OR-17	Ngem 1	Osborne 1966

*Site numbers used by Snyder and Butler (1997)

^Site numbers used by Osborne (1966), Masse et al. (1982) and Masse (1989).



Rock art. Photo by Mark Willis.



Figure 43. Dmasech Island megapode nest in archaeological site.
Photo Clark/Reepmeyer – ANU



Figure 44. Little Mariar effect of tree collapse on stone wall feature.
Photo Clark/Reepmeyer – ANU



Figure 45. Little Mariar wave impact on prehistoric stone wall.
Photo Clark/Reepmeyer – ANU

Ngeruktabel

An extensive set of stone features on the ridgeline southeast of Oimaderuul recorded by Snyder (1985) could not be located or identified in 2010. The only features encountered were several terraces and stone platforms on the south slopes and ridge tops. These features appeared to have been disturbed by the extensive Japanese WWII defensive positions covering the ridge overlooking the beach. The intermingling of Japanese and Palauan stone features can be separated into appropriate time periods when the structures are clearly of WWII vintage as with many circular or ‘C-shaped’ features roofed with corrugated iron. What is less evident is whether Japanese activity substantially modified parts of prehistoric sites by using ancient stonework to construct defenses. In the 1980s, human remains were found in a toilet block excavation on Oimaderuul Beach. Megapode mounds have disturbed prehistoric deposits on the sand plain as have land crabs in moist back beach areas.

The preservation of stone structures on both Mariar beach flats is poor compared to the structural remains located on limestone slopes and ridges. The defensive stone wall on Big Mariar beach has been impacted by tree growth and decay which has collapsed sections of the wall and reduced its height. In the 1980s sections of the wall were measured at almost 2m high, but in 2010 the maximum height was only 1.1-1.2m. Stones from the defensive wall have been used by recent visitors taken to make cooking hearths. On Little Mariar beach, two parallel defensive walls were recorded on the sand plain in the 1980s. The landward defensive wall had completely disappeared in 2010 as had most of the accompanying recorded stone platforms and other features. The second defensive wall on the beach berm in front of the steeply shelving beach has almost completely disappeared due to wave erosion and tree damage (**Figure 44**). When the roots of the large strandline taxa (e.g., *Calophyllum inophyllum*, btaches) growing on the wall become undermined by storm waves the trees collapse depositing the displaced stone on the steep beach where they are removed by wave action (**Figure 45**). A kitchen-cooking area in the temporary camp structure

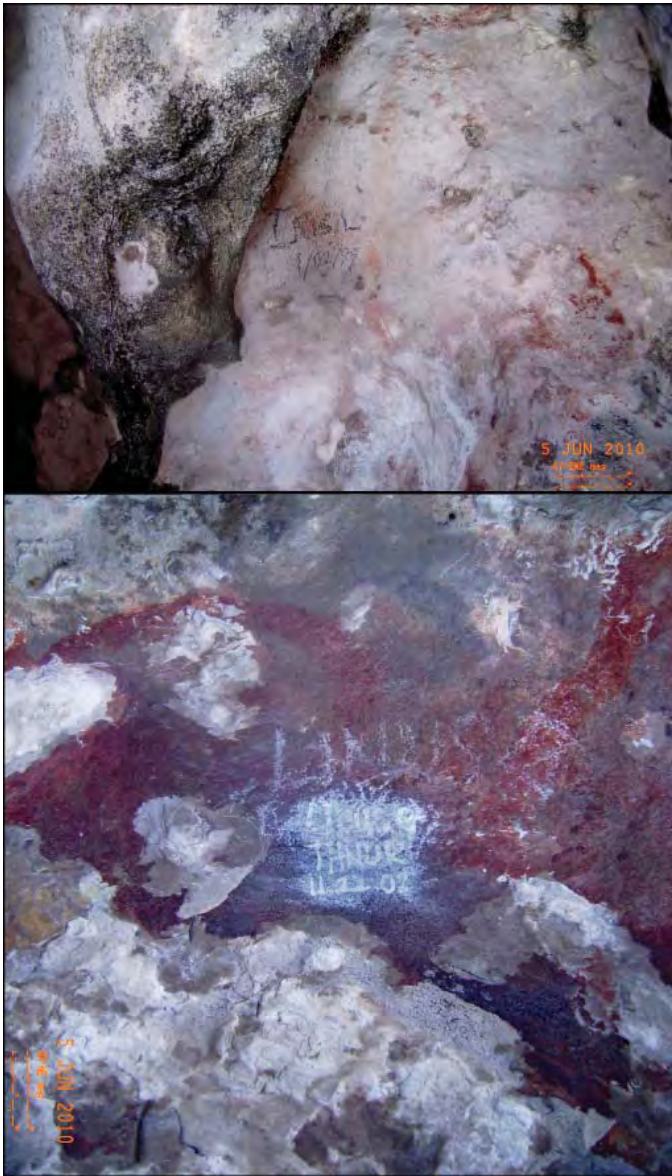


Figure 46. Ulong Island graffiti on rock art. Photo Clark/Reepmeyer – ANU

recorded in 2010 appears to be made from stones collected from nearby prehistoric features.

Ulong

The prehistoric sites on Ulong Island are generally well preserved. The main feature of the stonework village, the defensive stone wall, has substantially intact sections in the north and just south of the first entrance. Much of the cultural deposit on the beach flat remains intact due to the distance from the sea and the location of the visitor area some 200m north of the stonework village site. However, humic acids have eroded shellfish remains from the surface and upper levels of the site. Nearby megapode mounds contain archaeological pottery



Figure 47. Ulong Island rock art covered by algae mat. Photo Clark/Reepmeyer – ANU

and food shell from the village site. The depth to which megapodes have disturbed the subsurface cultural deposit is unknown.

The major rock art site on Ulong Island is partly destroyed by graffiti. Incised or painted directly onto the prehistoric red-painted art, the graffiti consists mainly of the names and dates of visitors (**Figure 46**). According to local informants, the cultural significance of the art site is not always recognized by visitors and tour guides. Continued unrestricted access is likely to result in further degradation to this significant rock art site. Rock art in a cave on Ulong Island has been partially covered by a moist mat of algae (**Figure 47**).

Ngeanges

Archaeological features on Ngeanges Island have been impacted by recent human activities and affected by WWII bombing/shelling. On the beach flat are recent occupational remains including a poorly preserved visitor's shelter and long drop toilet and piles of rubbish and used building materials. A possible Yapese stone money quarry and stonework features on the southern limestone outcrop appear to be mixed with Japanese defensive positions. Several bomb fragments were found in excavation units and a large bomb crater was recorded on the beach flat. Dense midden deposits around the base of Ngeanges' limestone outcrops are partially disturbed by land crab activity. Shallow, wide rubbish pits excavated into the beach sediments have displaced prehistoric remains.



Ngemelis Island Complex. Photo by Patrick Colin.

Present State of Conservation – Natural Heritage Habitat trends

Coastal habitats in Palau, including within the RISL have been mapped (Idip et al. 2007; Collins, pers. comm. (see box “A visit with a visiting researcher”). Individual zones were mapped at a scale of 1:80,000. Baseline maps indicate the square area across six classes:

1. Algae
2. Coral
3. Sand
4. Carbonate
5. Seagrass
6. Mud

Total values for reefs and mangroves for Koror State (**Table 10**) were analyzed by Yukihiro et al. (2007) using information from Maragos et al. (1994). Additional data is required to exclude the inhabited sections of Koror State that are not proposed for inscription under the World Heritage Convention. The Palau Conservation Society (PCS 2003) conducted a baseline survey of the Ngemelis

Complex’s outer reef, recording the percent cover of substrate in ten categories (**Table 11**).

The Palau Automated Land and Resource Information System (PALARIS) maintains IKONOS imagery, limited LIDAR imagery, and other satellite imagery. With additional analysis, trends in terrestrial land cover can be estimated. Much of the Rock Island forest was stressed during a severe drought associated with the 1998 ENSO event. Permanent monitoring sites for the forest is needed to determine loss or changes in biodiversity during extreme climate events.

Species trends

Coral

Across all reef types, coral cover declined from 50 to 70 percent in 1992 (Maragos et al. 1994; Maragos and Cook 1995) to 14 to 23 percent in 2001. Compared to other sites in Palau, fringing and barrier reefs in the RISL had higher coral cover (37 to 41 percent) than all other sites (Golbuu et al. 2007b). Corals in the RISL appear to be recovering

Table 10. Area of mangrove and reef in Koror State*

State	Mangrove	Fringing reef	Lagoon and passes			Barrier Reefs		Reef Holes	Islands
	km ²	km ²	km ²	km	# patch reefs	km ²	Km	Number	Number
Koror	1.6	19.2	500.0	112.8	683	100.0	86.4	100	491

* Additional research is needed to determine values for the RISL alone.

Table 11. Substrate percent cover at Ngemelis Island Complex

Location and Depth	Percent Cover									
	Hard Coral	Rock	Soft Coral	Sponge	Fleshy	Seaweed	Sand	Silt/Clay	Other	Bleached Coral
Rubble Big Drop Off 30ft	25.00	15.88	17.65	27.57	10.66	0.59	0.07	1.69	0.07	0.07
Big Drop Off 50ft	25.91	15.00	22.05	22.95	9.20	0.91	0.00	2.27	0.11	0.34
Blue Corner SE 30ft	42.75	24.75	12.50	14.08	2.25	0.42	0.08	1.58	0.08	1.50
Blue Corner SE 50ft	34.20	14.89	17.84	17.73	4.32	2.27	0.00	1.59	0.23	6.93
Blue Hole North 30ft	36.75	38.00	10.83	10.00	2.83	0.00	0.00	1.08	0.50	0.00
Blue Hole North 50ft	32.08	18.44	15.52	15.00	15.83	0.42	0.00	2.19	0.21	0.31
Turtle Corner 30ft	40.58	30.33	12.42	12.25	1.00	0.33	0.00	2.08	0.25	0.67
Turtle Corner 50ft	33.27	20.58	21.92	18.17	1.63	0.67	0.10	2.50	0.10	1.06
Virgin Hole 30ft	36.03	30.59	12.28	18.24	0.59	0.15	0.07	1.47	0.29	0.22
Virgin Hole 50ft	37.73	22.16	13.30	19.89	3.18	0.45	0.00	1.93	0.00	1.36

more quickly from the 1998 bleaching event than other areas in Palau.

Compared to other sites in Palau, increase in coral cover between 2001 and 2004 was greatest on fringing reefs in the RISL. Coral recruitment rates between 2001 and 2004 had a mean of 8.1 + 0.4 recruits/m², the highest recruitment rate of sites surveyed in Palau (Golbuu et al. 2007b).

Fish, Sharks, and Marine Invertebrates

Fishermen's perceptions and limited data show that some populations of customary fish species continue to decline (Matthews 2004). Long-term monitoring at the Ngerumekaol Conservation Area, a spawning aggregation site for groupers, shows that fish populations are stable compared with other non-protected spawning sites in Palau. Current monitoring at different sites in the RISL indicates that selected fish populations at the monitoring sites are stable (Marino et al. 2008). Winterbottom (2004, unpub.) produced a list of fish species in the RISL. The Palau Conservation Society (PCS 2003) surveyed certain species of fish, sharks, and invertebrates at two different depths on the fringing

reefs of the Ngemelis Complex (**Table 12**). Closed marine protected areas that were established in hopes of helping fish populations to rebound show positive signs of increasing fish abundance but the spillover effects have yet to be demonstrated (PICRC unpub.). There is evidence of poaching in closed sites (Matthews 2004).

Reptiles

The Palau Conservation Society (PCS 2003) surveyed sea turtles on the Ngemelis Complex fringing reef (**Table 12**). There is local concern about turtle harvesting and socioeconomic studies indicate that turtle populations are declining, that their average size is decreasing, and that there is less successful nesting than in the past (PCS 2002). In 2003, a major national education campaign targeted sea turtle conservation. A current "Turtle Friendly Campaign" recognizes shops and restaurants that pledge to refrain from selling turtle products. The commercial establishments display stickers promoting their turtle-free status. In December 2010, Palau's National Congress passed legislation placing a 5-year moratorium on harvesting of Hawksbill sea turtles.

Table 12. Range of average number of fish and turtles per transect at Ngemelis Island Complex

Species	#/transect	#/transect
	at 30ft	at 50ft
Bluefin trevally	0.9 - 2.6	1.2 - 2.5
Humphead wrasse*	0.3 - 0.7	0.25 - 0.7
Humpback Snapper	1.0 - 32.0	1.0 - 10.0
Complexers (8 sp.)	0.2 - 1.45	0.2 - 1.6
Bignosed Surgeonfish	6.5 - 13.0	5.0 - 8.0
Moorish Idol	3.8 - 11.0	2.0 - 6.0
Bumphead Parrotfish*	0.1 - 7.0	0.9 - 4.0
Sharks (3 sp)	0.05 - 0.55	0 - 1.3
<i>Tridacna crocea</i>	0.1 - 1.5	0 - 0.26
<i>T. squamosa</i> & <i>T. maxima</i>	0 - 2.6	0 - 0.35
Green Sea Turtles*	0.15 - 0.3	0.15 - 0.7
Hawksbill Sea Turtles*	0.1 - 0.4	0.1 - 0.3

* On IUCN Threatened or Endangered List

A 2003 survey of crocodiles estimated the population to be 500 to 750 non-hatchling individuals (Brazaitis et al. 2003). A national management plan was developed for the protection and management of crocodiles and their habitat that includes the RISL.

Mammals

In a September 2007 survey, 24 dugongs (16 adults and 8 calves) were spotted around and in the RISL (Kitalong Hillman et al. 2008). During 2009-2010, three dugong were found dead in the RISL, presumably incidental deaths due to illegal fishing practices. Dugongs have played an important cultural role in Palauan society. In the past they were hunted for their meat and bones, used in ceremonies, used to indicate status, and to make jewelry. However, in a 2003 survey a large majority of respondents indicated that the cultural significance of the dugong is diminishing, which may be leading to decreased dugong hunting. Poaching remains a problem, although harming a dugong is severely punished with a fine of US\$10,000 for the first offense. Private, community, and non-profit groups worked together to promote 2010 as the Year of the Dugong. Education and research activities continue to as part of an ongoing campaign to protect dugongs.

Table 13. Trends in bird populations, RISL compared to Palau as a whole (1991 to 2005)

Species	Average #Birds/ Station		Trend (1991 to 2005)	
	2005	1991	RISL	Palau
Micronesian Megapode*	0.09	0.2	-	NC
Brown Noddy	0.48	6.06	-	-
Black Noddy	1.79	8.5	-	-
Palau Fruit Dove**	2.7	8.24	-	-
Micronesian Pigeon*	1.06	3.26	-	-
Collared Kingfisher	0.31	0.37	-	NC
Rusty-capped Kingfisher**	0.04	0.26	-	NC
Cicadabird**	0.19	0.28	-	NC
Palau Flycatcher**	0.96	2.57	-	NC
Palau Fantail**	0.39	1.08	-	NC
Palau Bush Warbler**	1.09	3.32	-	NC
Micronesian Starling	1.65	4.21	-	-
Caroline Islands White Eye	1.3	3.89	-	-
Dusky White Eye**	1.41	3.87	-	-
Giant White Eye* **	0.49	1.48	-	NC
Bridled Tern	0.15	0.033	+	NC
Nicobar Pigeon*	1	0.61	+	+
White-tailed Tropicbird	0.62	0.59	NC	NC
Black-naped Tern	0.42	0.44	NC	NC
Palau Swiftlet**	1.06	1.28	NC	NC
Morningbird**	0.28	0.31	NC	-
Micronesian Honeyeater	0.96	1.2	NC	+

+ Increase; - Decrease; NC No change; * On IUCN Threatened or Endangered List; ** Endemic (species level)

Fruit bat populations appeared to have increased significantly between 1991 and 2005 (Wiles unpub.).

Birds

VanderWerf (2007) reported declines for most birds surveyed in the RISL between 1991 and 2005 (Table 13). Number of birds observed and birds-per-station were recorded. One notable exception was the Nicobar Pigeon, which had a significant increase in the RISL, despite global declines elsewhere. One postulate for the overall decline is that most birds in Palau rely on forest habitat.



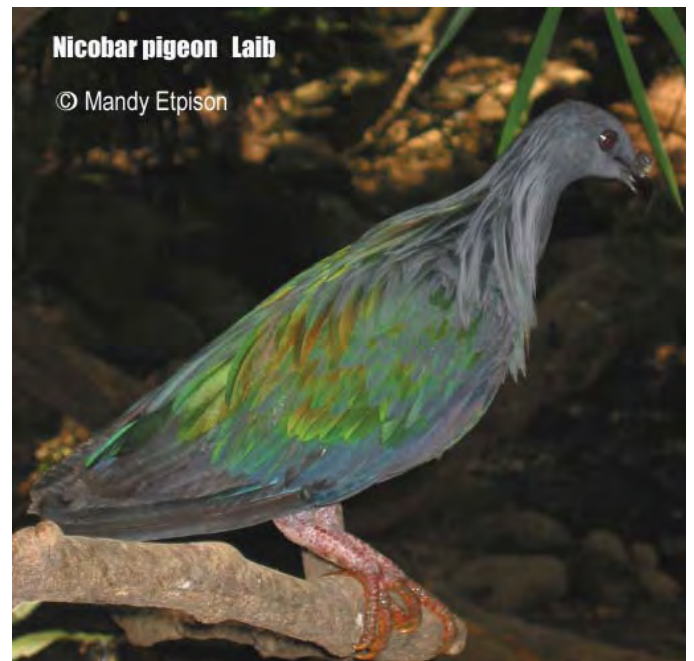
Ponapea palauensis. Photo by Ann Kitalong.

The 1998 ENSO event and severe drought caused defoliation and stress to many of the Rock Island's trees. Although the vegetation has recovered, it is possible that bird populations have not recovered to the baseline numbers. In 2010 the President of Palau signed a Presidential Proclamation mandating national bird monitoring. The Belau National Museum will carry out yearly surveys, including in the RISL, and produce a yearly State of the Birds report. Two introduced birds, the Sulfur-crested Cockatoo and Eclectus Parrot declined between 1991 and 2005 (VanderWerf 2007). Most birds are protected by National Law, although poaching of Micronesian Pigeons does occur. Poaching of the pigeon is likely less frequent in the RISL, due to the expense of obtaining a boat and fuel to reach the Rock Islands.

Plants

The critically endangered endemic *Ponapea palauensis* is only known in three sites of which two are within the Property. Twenty DNA samples were taken from the plants at these sites (Lewis et al. 2008). The plants appear to be threatened by invasive species. In 2008, there was considerable damage to the leaves of *P. palauensis* in one site

within the RISL presumably by the introduced Sulfur-crested Cockatoo. In 2009 further damage was observed including insect damage (Kitalong, pers. comm. 2010). Coastal erosion, especially along the eastern rock island beaches, is causing loss of coastal vegetation. Coastal vegetation is critical for beach stabilization and as nesting habitat, especially for the critically endangered hawksbill turtles.



Nicobar pigeon Laih

© Mandy Etpison

4b. Factors affecting the Property

Development pressures

Tourism development on land is perhaps the greatest development pressure in Koror, with all other pressures related to this. However, cultural and environmental heritage is of paramount importance to the Republic of Palau, as is continued economic diversification and the development of sustainable tourism. Under the Rock Islands Southern Lagoon Area Management Plan 2004–2008, Koror State is responsible for the resource base of tourism in the Rock Islands. At the national level, the Ministry of Natural Resources, Environment, and Tourism has oversight over environmental resource management while the Ministry of Community and Cultural Affairs oversees cultural resource management.

There is one development in the Property. Dolphins Pacific is a dolphin education and research facility

located on the northeast side of Ngeruktabel Island. Recently, small cell sites powered by solar panels have been installed on higher elevations in the Rock Islands to provide wider communications coverage. As mandated by the national Historic and Cultural Preservation Law, Title 19, whose decisions are reviewed and concurred with by the Koror State Legislature under Bill K8-183-2007, such installation sites must first be inspected and granted archaeological clearance by the Bureau of Arts and Culture. With their guidance, the cell sites have not had an adverse affect on prehistoric sites. The Management Plan strongly discourages any development, commercial or non-commercial, in the Rock Islands.

Because the RISL is zoned a conservation area it is largely undeveloped and has seen very little



Fishing boats. Photo by Ron Leidich.



Divers. Photo by Paul Collins.

direct impact from infrastructure, construction or development activities. There are small visitor infrastructures, such as picnic structures and composting toilet facilities on designated rock islands to support visitors but they do not endanger the value of the property. The potential designation of RISL as a World Heritage site will reinforce this current zoning and ensure that no major infrastructure development will be undertaken that will affect the RISL's outstanding natural and cultural features.

Non-tourism and non-fishing commercial uses in the property include one sand-mining operation adjacent to Makeald reef, close to the Malakal Harbor. The mining operation operates under an environmental permit from the EQPB and a use permit from Koror State. The permit expires in 2012, and the continuation of any sand mining will be considered during revisions of the Management Plan. The sand mining operation has been conducting its activities for over ten years with only localized impacts (within the conditions of its permits) observed. There is harvesting of coral for lime production in small areas near Ngerchong and Ngerklim but the demand for this source of lime has been steadily decreasing due to competition from other sources.

There are aquaculture sites within waters close to the excluded urban zone and are thus considered special management zones within the boundary of the property. However, only localized impacts have been observed. Both the EQPB and Koror State regulate aquaculture and all permits for aquaculture will require best practices and environmental sustainability.

There is rising concern regarding the potential impact of motorized boats, particularly the pollution that may result from leaks of oil and fuel. There has been no evidence to show that there is indeed an impact, however, and research into this area is needed. Koror State Government has moved to outlaw two-stroke jet ski engines and only to allow four-stroke engines.

Sewage pollution may be a potential concern on the northern part of the property closer to Koror Island, the population and commerce center. Currently, the sewage system is a ponding system with no treatments that drains into the RISL. All waters are regulated by the Environmental Quality Protection Board to minimize pollution and environmental impact. Hamner (et al. 1997) found no evidence of extensive damage by levels of nutrients or terrestrial sediment. The 2011 National Water and Sewage Act established the Palau Water and Sewer Corporation and enabled Palau to secure a \$16 million dollar loan from the Asian Development Bank for upgrades to the sewer system.

Although Palau's commercial port is not within the RISL area, its proximity means there is potential for oil spills that may affect the property. However, to date there have not been any major oil spills within the RISL. Any shipping company that operates in Palau is required by the Environmental Quality Protection Board (EQPB) to submit a contingency oil spill response plan for approval that will be implemented in the case of an oil spill. EQPB has received assistance from regional organizations such as the Secretariat of the Pacific Environment Programme, for trainings on spill response and ballast water inspections. Hamner (et al. 1997) found little anchorage damage from boats at the nearby Malakal Harbor.

The nation's largest landfill is in Koror and may drain into the RISL. A national recycling program has recently been established to minimize waste going into the landfill and the national government is in the process of establishing a more secure national landfill. Although effluent from the landfill drains into the RISL, impacts appear to be localized, as corals in the nearby Nikko Bay are some of the most fragile and pristine in Palau.

Visitor/tourism pressure

The RISL is the tourism destination for Palau. The Management Plan has identified certain Rock Islands and reef areas as tourist areas to minimize impact on the RISL. The management plan identifies uses according to six zones. In addition to

active management of the RISL, Palau is trying to diversify tourist attractions and activity to spread the tourist pressure to other islands so that RISL does not suffer degradation from tourist-related activities.

In the last decades Palau's tourist numbers have doubled from a little over 50,000 to more than 100,000. Approximately 80 percent of tourists to Palau visit the RISL. In 2009 tourists were largely from Asia (Japan 32%, Taiwan 20%, Korea 16%) with far fewer from the U.S. (7%), Micronesia-Guam (5%), the Philippines (4%), and Europe (3%). The Rock Islands regularly ranked in the top three dive destinations in the world. To help manage the high volume of visitors, Legislation (K8-180-2007) was passed in 2007 for a 'Rock Island Use Fee' of US\$25 for tourists using the Rock Islands and US\$35 for tourists visiting Ongeim'l Tketau (Jellyfish Lake). In late 2011 the fee for Ongeim'l Tketau was raised to \$100.

The majority of dive-focused tourists do not visit any archaeological sites. Tour operators do lead some groups to the Rock Island's World War II sites and the more easily accessible stonework villages. Hence, to date, tourism has had a minor impact on the RISL's cultural remains. The 2008 Tourism Action Plan for Palau states that: "*Terrestrial habitats are highly culturally significant but largely unexplored by tourism.*" Increasing tourist interest in these cultural sites is expected in the future. The current revision process to the Management Plan is addressing cultural sites as a priority focus area.

The Rock Island's cultural sites are known to many Palauans and the limestone island landscape is associated with oral traditions, myths, proverbs, and place names that are integral to the history and culture of the indigenous people. The local population uses the Rock Islands for recreational picnics and celebrations, short stays during fishing and diving expeditions, hunting of coconut crabs and fruit bats, collection of medicinal and economic plants, and other traditional activities that preserve a connection with ancestral locations. Collectively local use has had a minor impact on the majority of the Rock Island cultural sites as use is concentrated on those sand plains/beaches that are accessible by

boat and have managed visitor facilities. Wharf/pier facilities for boat mooring have generally not been constructed as motor boats are moored in the intertidal zone or drawn onto sandy beaches.

Several sand plain/beach areas that do not have visitor facilities hold prehistoric remains of stonework villages that can suffer damage from the construction of unpermitted informal camp structures and amenities. Title 19 requires an archaeological clearance from the Bureau of Arts and Culture before any earthmoving, and the Environmental Quality Protection Board (EQPB) conducts monitoring and assesses fines for unpermitted structures, and can require their removal. However, capacity limitations at EQPB make it difficult to control the building of all smaller, informal structures.

Specific site threats and their effect on cultural sites in the Rock Islands are listed in **Table 14**, which shows that cultural sites located on sand plain/beach environments are most at risk from human and natural factors. Cultural sites located in limestone karst are often very well-preserved because they require significantly more effort to access and are out of reach of the sea.

Burial caves and rock art sites are fragile, culturally sensitive, and important scientific sites that are at heightened risk from human activity such as foot traffic, fossicking, and graffiti. Access to these sites will be managed by Koror State as unregulated visits will result in substantial negative site impacts.

Number of inhabitants within the Property

There are no permanent inhabitants within the Property. Most visitors are day users, with infrequent camping and overnight use at limited sites.

Environmental pressures

Environmental pressures are expected to impact cultural sites in the Rock Islands, particularly the long-term effects of archipelago subsidence and sea level rise through global warming. Indigenous and introduced plants and animals can have adverse effects on cultural properties in the Rock Islands. In the short term, these impacts can be classed as

relatively minor. Over longer intervals tree growth, death, and collapse can degrade the integrity of prehistoric sites, especially stonework village remains.

Climate change is an important factor in the Rock Islands. Reduced precipitation during the Little Ice Age contributed to island abandonment and the creation of a relict landscape of stonework villages. The forecast trend toward a warmer and wetter climate would likely lead to higher rates of erosion on the Rock Island. Rock art sites and human remains in burial caves are potentially at risk from increased water flows. Future sea level rise has implications for those Rock Island cultural sites that are close to the sea. Several stonework features and prehistoric deposits have been removed by wave action in the last 30 years and loss of the Rock Islands' cultural resources that are located on beaches and sand plains is likely to continue with anticipated sea level rise.

The fragile ecosystems of the marine lakes are susceptible to climate change (Dawson et al. 2001;

Martin et al. 2005) and threatened by non-native species introductions (Patris et al. 2010), collectively classifying them as vulnerable habitats of significant biological diversity.

The impact of climate change poses a challenge to the RISL. As previously discussed, the 1998 ENSO event caused a decline in *Mastigias* medusa in Jellyfish Lake (Dawson 2000) as well as widespread coral bleaching in the RISL patch reef systems with less impact on the fringing reefs which are shaded by Rock Island forests (Bruno et al. 2001; Golbuu et al. 2007b). Furthermore, much of the coral reef system has recovered following the bleaching event. Therefore, while within the RISL impact of climate change cannot be avoided, management of human induced threats such as overfishing and habitat degradation can enable more rapid recovery following natural disturbances.

Crown-of-thorn starfish (COTS) outbreaks have been a concern within the RISL. This phenomenon was documented as early as the 1970s. It is unknown how the COTS outbreaks occurred;

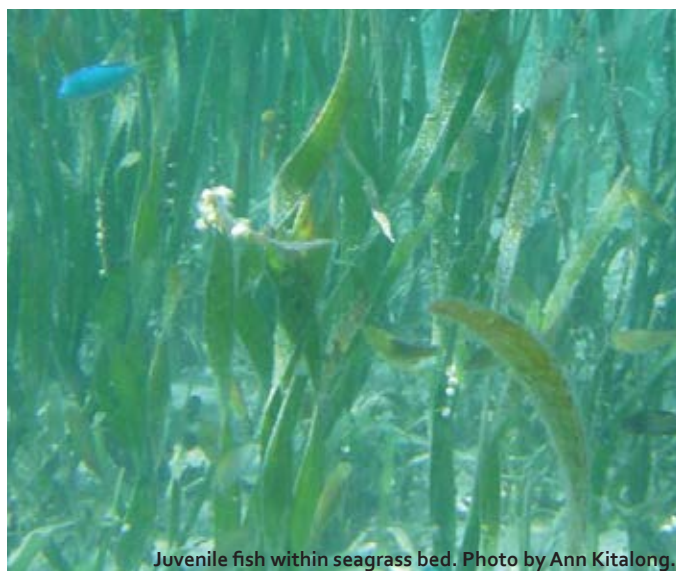
Table 14. Site threats and their impact on Rock Island cultural sites.

Disturbance factor	Stonework feature - sand plain	Stonework feature - limestone	Stonework midden - sand plain	Stonework burial - sand plain	Canoe infrastructure - sand plain	Colonization sites - sand plain	Burial cave - limestone	Rock art - limestone	Yapese quarry - limestone	Western contact - sand plain	WWII sites - marine/terrestrial
Tree growth	X	X	X	X	X	X	O	O	X	X	O
Land crabs	X	O	X	O	O	X	O	O	O	X	O
Megapode	X	O	X	O	X	O	O	O	O	X	O
Microbiological	O	O	O	O	O	O	X	X	O	O	X
Forest fire	O	O	O	O	O	O	O	O	O	O	O
Tropical storm	X	O	X	X	X	X	X	O	O	X	X
Tsunami	X	O	X	X	X	O	O	O	O	X	X
Climate change	X	O	X	X	X	O	X	X	O	X	X
Visit facilities	X	O	X	X	X	O	O	O	O	O	O
Foot traffic	X	O	X	O	O	O	X	O	X	O	X
Fossicking	O	O	O	O	O	O	X	X	X	X	X
Graffiti	O	O	O	O	O	O	O	X	O	O	O
Factor total	8	1	8	5	6	3	5	4	3	7	6

however, data from elsewhere support the theory that COTS outbreaks may be related to nutrient inputs. Currently, COTS outbreaks have been limited to a small area within the RISL that has allowed for successful controlled intervention. Tour operators and Koror State Government have collaborated in the past to control the outbreaks by removing COTS from the affected areas.

Introduced and invasive species pose a threat to the biological and economic value of the Property's resources. Although relatively few species have become established in the RISL, invasive species have the potential to alter the natural structure and balance of the RISL's marine and land ecosystem if they are not carefully controlled.

Ponapea palauensis is threatened by the introduced Sulfur-crested Cockatoo, which feeds on it (Costion et al. 2009). A 2003 report (Space et al. 2003) provides an extensive list of invasive species throughout Palau, including the nominated area. The authors suggest eradication strategies for some species in the RISL such as *Chromolaena odorata*, *Clerodendrum quadriloculare*, *Stachytarpheta cayennensis* and *Timonius timon*. Some islands have populations of cats, rats, monitor lizards and monkeys that disrupt the natural ecosystems. There has been discovery of an invasive sea anemone (*Aiptasia* sp.) in Ongeim'l Tketau. There may be other invasive species within the RISL that have yet to be documented.



Juvenile fish within seagrass bed. Photo by Ann Kitalong.

Laws exist to curb the spread of invasive species. It is illegal to transport potential invasive species in the RISL such as the Macaque monkey (*Macaca fascicularis*). In the Management Plan, Koror State addresses its goals for preventing the establishment and spread of new marine or terrestrial species and for the eradication and control of existing invasive species through education, research, and monitoring.

Natural disasters and preparedness

The main natural disasters to be considered a risk for the RISL are tropical storms, tsunami, and forest fire. During ENSO events, like that of 1997-1998, the Rock Island's limestone forest and sand plain vegetation dries out and is vulnerable to human and natural fires. The direct impact of forest fires on prehistoric cultural sites is minimal as stonework and sub-surface cultural remains would not be significantly affected. However, cohort death of forest trees due to fire damage can result in substantial site disturbance from sediment displaced in falling tree roots. Typhoons and tropical storms occur from June through November and are accompanied by high winds, substantial precipitation, and large wave surges. This rough weather can damage reefs and prehistoric sites through tree fall and sand plain removal.

The Palau National Tsunami Capacity Assessment report which evaluates the capacity of Palau to receive, communicate, and effectively respond to tsunami warnings is currently under review. Cultural sites first recorded in the 1980s have not been noticeably affected by tsunami damage and the Rock Islands are resilient overall to natural disasters.

Because Palau is outside the typhoon belt, there has been very limited incidence of major typhoons that have affected the whole archipelago. While natural disasters cannot be stopped, effective management of coral reefs by ensuring key ecological processes are preserved will allow for rapid coral reef recovery. Current management approaches such as setting up marine protected areas and identifying resilient areas will ensure that these key reef processes are maintained and therefore when natural disasters occur, coral reef systems within the RISL will bounce back.

5. Protection and Management

5.a Ownership

Property ownership in Palau is quite different than property ownership in a strict western context. Most property is not owned by individuals. Communal land ownership is more common with much of the communal land being owned by clans. As is the case of the Rock Islands Southern Lagoon area, this property has historically belonged to the clans of Koror and has been held in stewardship and guarded for the good of all by the Chiefs of Koror State. More recently, the question of ownership has been addressed by both the National and Koror State constitutions, and a number of court cases.

Ownership of the resources of the sea and the reef are governed by the constitution of the Republic of Palau and the Koror State constitution. The States own all living and non-living resources from the land to twelve nautical miles seaward, and the National Government owns all living and non-living resources beyond the territory of the States.

Article I, section 2 of the constitution of the Republic of Palau (effective January 1, 1981) states, “Each state shall have exclusive ownership of all living and non-living resources, except highly migratory fish, from the land to twelve



Tridacna gigas. Photo by Patrick Colin.

Rock Islands Southern Lagoon Area Management Plan Zones

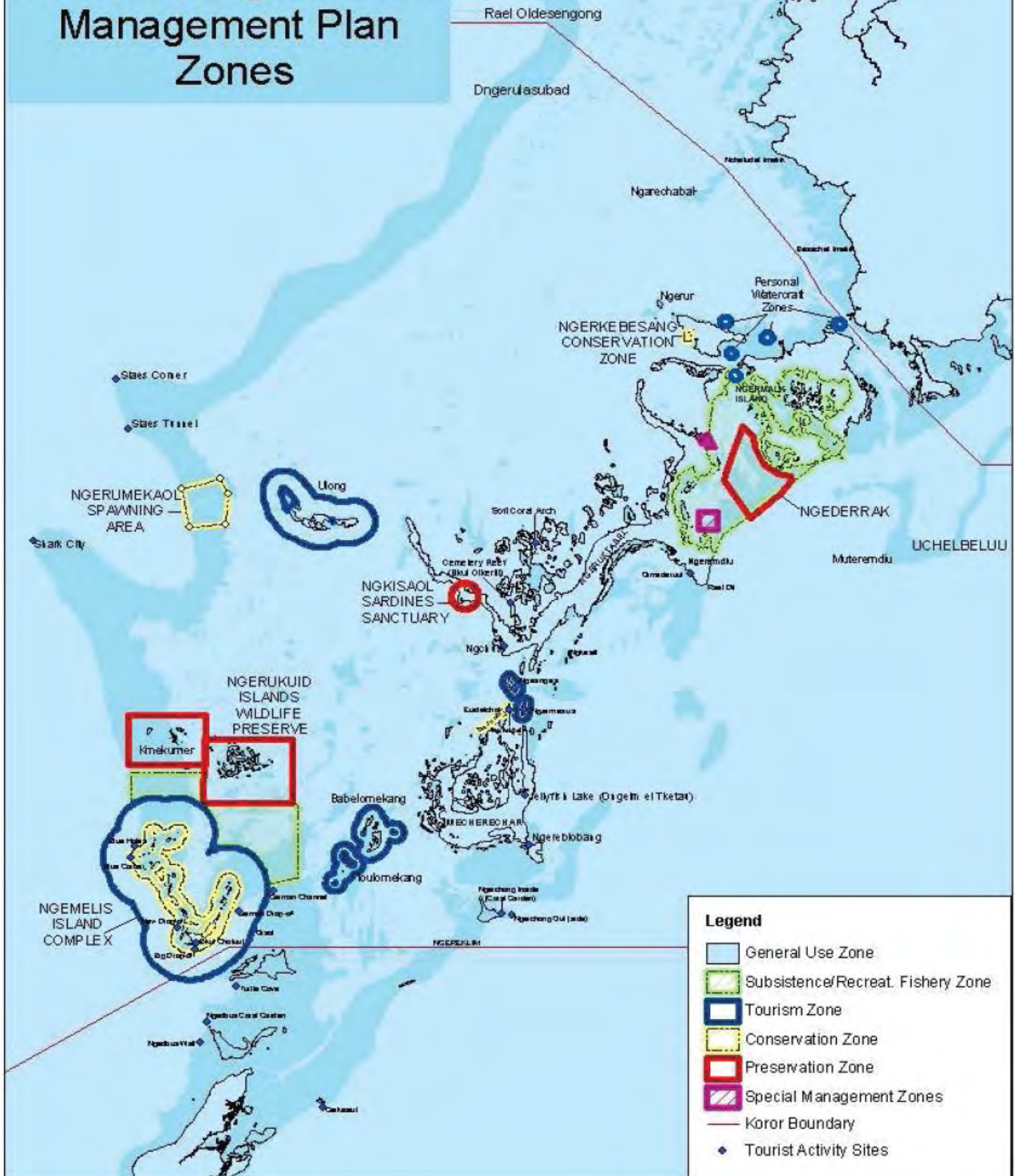


Figure 48. Rock Islands/Southern Lagoon management zones.

(12) nautical miles seaward from the traditional baselines; provided, however, that traditional fishing rights and practices shall not be impaired.”

This section was amended in the Palau General Election of November 4, 2008, to read as follows:

“Each state shall have exclusive ownership of all living and non-living resources, except highly migratory fish, within the twelve (12) nautical mile territorial sea; provided, however, that traditional fishing rights and practices shall not be impaired.”

The Koror State constitution, approved in October of 1983, provides,

“The State of Koror shall have exclusive ownership of all living and non-living resources of the seabed, subsoil, water column, insular shelves and air space from the land to twelve (12) nautical miles seaward from the traditional baseline, as provided in the Constitution of the Republic of Palau.”

In a court case that was ultimately resolved on appeal, the traditional chiefs asked the court to clarify issues relating to the ownership and control of areas below the ordinary high water mark (House of Traditional Leaders et al., vs. Koror State Government et al., Civil Appeal No. 09-004, “Opinion” of February 10, 2010). The Appellate Court affirmed the decision of the Trial Court, and affirmed that Koror State Government holds title to all lands below the ordinary high water mark, and that Koror State Government holds Koror State public lands in trust, and that Koror State Government has the authority and power to administer public lands below the ordinary high water mark.

This case was preceded by an earlier holding, also affirmed on appeal, that the Koror State Public Lands Authority holds title to public lands (such as the “Rock Islands”) above the ordinary high water mark (House of Traditional Leaders et al., vs. Koror State Government et al., Civil Appeal Nos. 06-070 and 06-075. Judgement and Decision dated December 17, 2008).

As of this date, none of the islands in the RISL have been awarded to any individual, lineage, or clan, so that none of the Rock Islands in the RISL are being developed for private interests.

5.b Protective designation

The Koror State Legislature has zoned all of the RISL as a “Conservation Zone” (Koror State Public Law No. K6-100B-99), and more recently, Koror State Public Law No. K9-222-2010 prohibits any permanent construction or development in the Rock Islands (other than tourist-related facilities). In 2011 Koror State also established Ngermalk Island, a section of land connected to the excluded urban zone, as a protected area.

Modern day conservation initiatives are supported by a range of State laws that regulate general resource use and recreational activities, and that designate protected areas within the property (See **Appendix D** for a Detailed List of Laws and Regulations affecting the RISL of Koror). Activity in the RISL of Koror is governed by the Rock Islands Southern Lagoon Area Management Plan 2004-2008 (**Appendix E**) and the Comprehensive Management Act.

In early 2011 the Koror State Planning Team adopted a new vision and goals as part of revisions to the Rock Islands Southern Lagoon Management Plan 2004-2008. The guiding vision is:

To maintain the spectacular beauty and the abundant and diverse natural and cultural resources of the Rock Islands Southern Lagoon Area, so that it can continue to be used and enjoyed by current and future generations of the people of Koror and Palau and remain a central part of our culture and lifestyle, and for the current and future enjoyment of the world.

The Planning Team also adopted five new guiding goals for the revised Plan:

Goal 1: Biodiversity/ Natural System Health

Maintain the full range and richness of biological diversity, species habitats, ecological processes and high environmental quality of the RISL.

Goal 2: Subsistence and Commercial Fisheries Improvement

Subsistence and commercial fishing and other extractive activities in the RISL are environmentally and economically sustainable and culturally compatible, and provide continued benefits to the people of Koror and Palau.

Goal 3: Cultural Preservation

Nurture and sustain Palauan culture by preserving and maintaining the landscapes, artifacts and oral traditions associated with the stonework village sites in the RISL, and preserve Palau's historical sites.

Goal 4: Tourism/Economic Enhancement

High quality tourism and recreational activities in the RISL are environmentally and economically sustainable, culturally compatible and provide benefits to the people of Koror and Palau.

Goal 5: Institutional Capacity Building

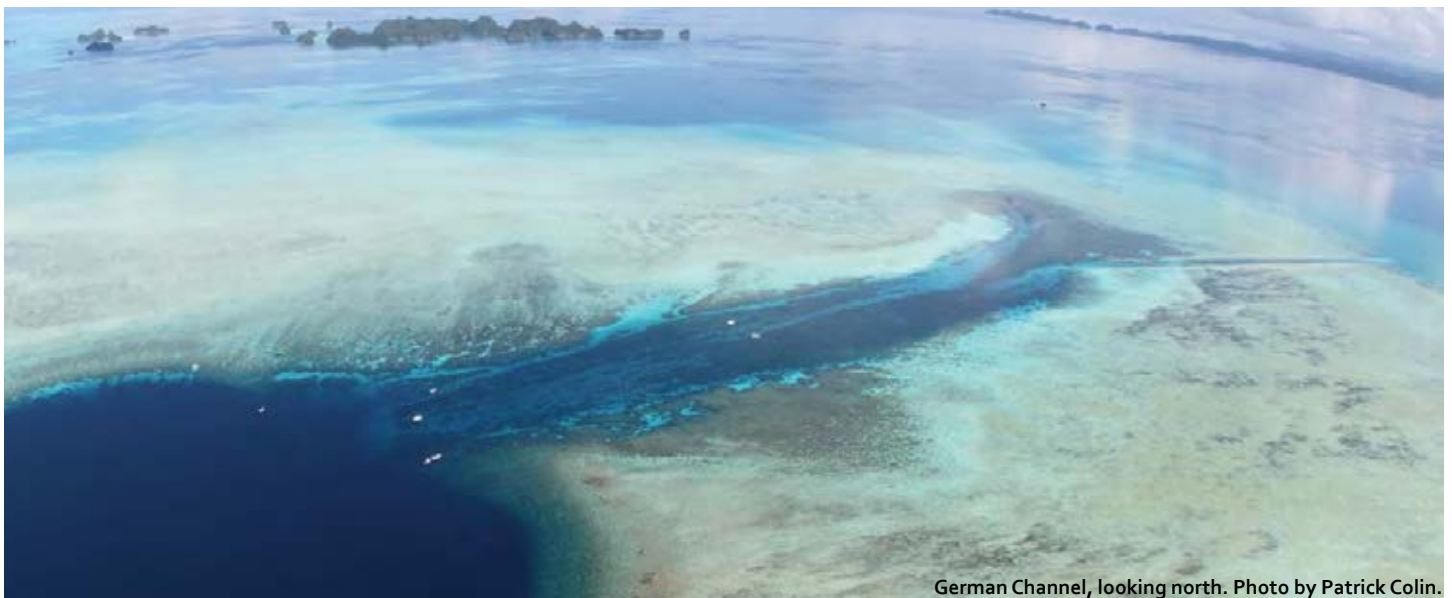
Improve the institutional capacity of Koror State Government to effectively manage the RISL, focusing on strengthening regulatory frameworks, enforcement and surveillance, and building relationships and communication with key organizations and stakeholders relevant to the implementation of activities.

The inclusion of a goal targeting cultural preservation is indicative of the growing awareness

of the global importance of the RISL's cultural sites. As with the previous plan, all uses of the area must be environmentally sustainable, culturally compatible, and provide benefits to the people of Koror and Palau. When the plan is finalized it will go through legislative adoption to give it the force of state law. To ensure passage, revision of the Management Plan is being conducted through a multiple stakeholder, collaborative process.

The Koror State Government has appointed the Koror State Public Lands Authority (KSPLA) and the Koror State Planning and Zoning Commission (KSPZC) to oversee all land and designate land use and zoning, respectively. The Koror State's Department of Conservation and Law Enforcement is responsible for administering the RISL according to the Management Plan and enforcing State environmental laws and historic preservation laws. They are supported by the National Division of Fish and Wildlife Protection and the Bureau of Arts and Culture that enforce national laws.

The Koror State Ranger program was established in 1989 to enforce curfew laws. In 1994 it became the Department of Conservation and Law Enforcement. Since the Department has been in existence, it has worked closely with the National Government as well as other locally-based agencies and organizations on management and research activities within the RISL area of Koror State. This



German Channel, looking north. Photo by Patrick Colin.



Koror State Governor Yositaka Adachi (seated left) and Peleliu State Governor Kangichi Uchau (seated right) sign a MOU to jointly manage German Channel. Photo courtesy of KSDCLE.

has resulted in the development of State regulations on resource use and activities and designation of six protected areas within the Property.

On January 25, 2011, the State Legislature passed Koror State Public Law No. K9-233-2011 to mandate yearly certification for all tour guides operating in the RISL, and to mandate the presence of a certified tour guide on all commercial tours. The law also provided financial provisions for regular tour guide training programs.

In January 2011, the governors of Koror State and neighboring Peleliu State signed a Memorandum of Understanding (MOU) to jointly manage and protect German Channel, a popular dive site and important feeding and breeding area for manta rays. The shared state borders fall within the channel.

National domestic fishing laws (**Appendix G**) also apply to the Property and are enforced by national enforcement officers at the Division of Fish and Wildlife Protection. Moreover, Koror State has joint patrols with the Division of Fish and Wildlife. Additional national regulations that control access to specific areas in the Property have been reinforced by State Law, and are thus enforced by the Rangers. This includes Palau's first protected

area, the Ngerukewid Islands Wildlife Preserve, which was established by the Trust Territory Government in 1956 and Koror State in 1999; and restrictions on fishing in Ngerumekaol Spawning Area that were established by National Law in 1976 and strengthened by State Law in 1999.

5.c Means of implementing protective measures Traditional Management

Long before modern conservation laws were developed, Palau's resources were managed by traditional cultural controls, such as marine tenure and *bul*. One of the most frequent and effective of such methods, *bul* is a temporary restriction or moratorium on certain activities. *Buls* are put into effect when called for by village chiefs (Marino 2007), typically at times of natural or human threat. In order to notify the community that a *bul* is in place, woven coconut fronds are placed on trees or poles at village entrances.

Traditional use and management of the property is a role for traditional leaders, and this role is explicitly recognized by the state governing authority and by the community. Regular consultation with traditional leaders is standard practice during all management and management planning for the property, for both biophysical and cultural resources.

Zoning

There is a detailed zoning plan for the RISL, included in the Management Plan (**Figure 48**).

Zones were developed based on guiding principles:

- Some biophysical features and/or cultural sites are more sensitive than others and require different management approaches.
- Certain activities, while acceptable individually, are mutually incompatible or cause cumulative effects and are best confined to distinctly different areas.
- Even where uses are compatible, designation of a zone helps to establish the management priorities for that particular area.
- It is desirable to concentrate facility development in certain relatively small and clearly defined areas, to minimize disturbance to natural and cultural sites, and the costs of services, such as toilets, rubbish bins, and picnic facilities.

Six zoning areas were created within the RISL to guide usage in the property: General Use Zones, Subsistence/Recreational Fishery Zones, Tourism Zones, Conservation Zones, Preservation Zones and Special Management Areas. Certain restrictions apply to all zones (**Table 15**).

- General Use Zones were created to enable the sustainable use of the Property and enable unrestricted access for all Palau residents and restricted access for visitors holding Rock Island Permits and includes all land areas not included in other zones and all marine areas not included in other zones.
- Subsistence/Recreational Fishery Zones enable sustainable subsistence and recreational harvesting adjacent to conservation and wildlife preservation zones. No commercial harvesting is permitted and restrictions are placed on recreational and subsistence harvesting methods and times.
- Tourist Zones promote low impact tourism activities that do not harm the environment or cultural sites. No harvesting or removal of resources is permitted in these areas. Due to safety and congestion concerns conflicting activities have been separated into dive/snorkel zones, snorkel zones, and personal

Table 15. Restrictions applicable to all RISL zones

- Prohibition of any new mining and dredging activities
- No entry by foreign yachts and boats, except in designated channels/routes, without a cruising permit from Koror State
- No entry to foreign commercial fishing vessels and other large vessels such as large luxury boats, commercial cruise liners, cargo and military ships (excluding registered live aboard boats), except in designated channels/routes
- Harvesting restrictions (seasons, size limits and methods) designated in National and State Laws
- No removal of cultural and historical artifacts
- No damage allowed to any portion of the coral reef ecosystem (eg. via anchoring, resource harvesting or ship grounding)
- No harvest of timber, except for cultural purposes with permit from Koror State
- Dumping of trash is prohibited; all litter must be removed from land and marine areas
- Use of personal water craft (jet skis) is restricted to designated water sport zones
- Tourists require a valid Rock Island Permit for recreational activities in any zone
- Only approved structures/facilities in support of flood and erosion prevention, conservation activities, and visitor use as defined in the Koror State "CD" conservation zone can be built on the Rock Islands,
- No domestic animals (cats, dogs, monkeys) may be brought to the rock islands

watercraft zones.

- Conservation Zones prioritize conservation of the RISL's cultural and biological attributes. Harvesting and removal of cultural resources is prohibited although areas are open for local recreational use and tourism (with a certified tour-guide).
- Preservation Zones provide the highest level of protection for biophysical attributes



Harvesting giant clams. Photo by Ann Kitalong.

and/or cultural heritage. No harvesting is permitted and access is prohibited.

- Special Management Zones were created to enable the continuation of existing activities that are economically valuable to Koror State but need special attention because of their actual or potential impacts on the RISL.

Numerous state laws restrict activities in the RISL. For instance, recently passed Koror State law K9-229-2010 prohibits the taking and introduction of new flora and fauna into the Ngemelis Island complex. This protection extends one mile from the shoreline of the island within the complex, when measured from the shoreline at the lowest tide (**Appendix D**).

Enforcement

On a daily basis within the waters and islands of the RISL, the Koror State Rangers are the primary

enforcers of the laws and regulations protecting the Rock Island's environment and cultural properties. The Koror State Rangers conduct regular patrols to monitor activity occurring at tourist and local community sites in the Rock Islands. They also conduct joint patrols with National Rangers from the Division of Fish and Wildlife Protection and work closely with the Bureau of Arts and Culture.

Collaborative efforts with national government agencies such as the Division of Marine Law Enforcement and the Bureau of Marine Resources for management, surveillance, and enforcement of the buffer zone will be further developed as part of revisions to the Management Plan. These agencies have jurisdiction over many pelagic species.

National laws and protections

Palau's Constitution requires the National Government to take positive actions to maintain a beautiful, healthful, and resourceful natural environment (Article VI). Numerous statutes and regulations have been adopted to carry out this mandate, and some of these deal directly with biodiversity and sustainable use of biological resources. Others, although not directly dealing with these issues, have significant impacts on cultural and environmental resources and sustainability.

Palau currently lacks a comprehensive statutory and regulatory conservation and preservation framework but has adopted a number of statutes dealing directly with biodiversity and use of cultural heritage resources, as described below.

Title 19 'Cultural Resources': Before declaring independence in 1994, Palau's cultural properties were safeguarded by Section 106 of the U.S. National Historic Preservation Act of 1966, as amended. Once independent Palau enacted a cultural resources bill which largely emulated the U.S. historic preservation laws. This comprehensive Historical and Cultural Preservation Act (Title 19 PNC 103) is administered within the Bureau of Arts and Culture (BAC), a part of the Ministry of Community and Cultural Affairs. BAC receives funding from the U.S. National Park Service and operates much like a U.S. state historic preservation



A snorkeler seen from an unusual perspective. Photo by Ron Leidich.

office. Pre-Contact sites in the RISL, as well as historic sites, such as World War II sunken Japanese and American ships and planes, Japanese fortifications and artifacts, and ruins of a lighthouse built during the German occupation of Palau, are protected by Title 19. Sites that are underwater, almost all World War II ships and planes and artillery pieces, are protected by Title 19, Chapter 3, the Palau Lagoon Monument legislation while surface remains are under the purview of Chapter 1 of the bill, the Historical and Cultural Preservation Act.

Three of BAC's five sections are pertinent to material cultural resources: Oral History and Ethnography, Survey and Inventory/Archaeology, and the Register of Historic Places. These sections work closely with the Society of Historians (*Klobaker a lbetel a Cherechar*)—representatives from each state who are recognized as being particularly knowledgeable about the traditions and narratives of their region. As a body, these groups are tasked with documenting, protecting, and fostering Palau's intangible and tangible cultural properties including, but not limited to, oral histories, customary practices, skills in applied arts, and archaeological sites. The BAC's Oral History and the Archaeology Sections collaborate by conducting annual joint surveys of cultural properties in one of Palau's 16 states and in determining historic clearances needed to obtain earthmoving permits for both small and large-scale construction and development projects.

A complete inventory of cultural sites is a priority for the Rock Islands. Because the Bureau of Arts and Culture's priority has been on the large volcanic island of Babeldaob due to the imminent threat of development, the annual BAC archaeological survey has yet to include the Rock Islands. The RISL is largely protected from development as the area is highly prized in its natural state as economically important for tourism.

Prior to any earthmoving by foreign development companies or local citizens, an Environmental Quality Protection Board (EQPB) earthmoving permit must be granted which has a clause

dedicated to cultural properties. BAC archaeologists must be given a project development map which they use to inspect the area to identify the presence of significant cultural resources. Should the parcel not contain archaeological site, BAC grants an archaeological clearance permitting earthmoving. However, if cultural properties are identified in the construction area, BAC either does not permit earthmoving due to the significance of the site or calls for a thorough investigation by a qualified archaeological firm to determine significance and mitigate potential negative impacts to the property.

Those cultural properties listed on the National Register of Historic Places are mandated for preservation into perpetuity. To become a registered site, a complete site dossier, including oral histories and archaeological investigations, is prepared for review by one of the states or municipalities. The file is submitted to the BAC Registrar where the nominated site is reviewed and evaluated by the Palau Historical and Cultural Advisory Board and BAC. If both approve of the significance of the property to Palau, the site is listed as a Palau Registered Site. Currently, seven cultural properties in the RISL are listed in Palau's National Register of Historic Places: Rois village on Ngemelis, Rois Cave on Uchularois in the Ngemelis group, Ulong village, the Ulong pictographs, Mariar village, Metukeruikull village, and the Japanese Era road to the Ngeremdiu lighthouse.

The decisions pertaining to Chapter 1 of Title 19, are reviewed and concurred with by the Koror State Legislature under Bill K8-183-2007. Passed on 28 May 2007, the bill ensures that application permits relating to historical sites and tangible cultural property within Koror receive protection at both the national and state level.

In addition to the prehistoric sites in the RISL, historic sites, such as sunken Japanese and American ships and planes destroyed during World War II, ruins of a military base built during the German occupation of Palau, World War II artifacts, and the remains of Japanese fortifications, are protected by the national Cultural Resources bill, Title 19. Sites

that are underwater, almost all ships and planes, are managed by Title 19, Chapter 3, the Palau Lagoon Monument legislation while surface remains are under the purview of Chapter 1 of the bill, the Historical and Cultural Preservation Act.

In case of the development of a property, **Title 19, Subchapter IV §151 - §157** states that:

1. A survey and review has to be conducted to assess impacts of projects affecting historical sites,
2. Findings of historical sites or tangible cultural property must be recorded to the state division,
3. Appropriate action, like recording, preservation of salvage must be conducted, and
4. Penalties are instated for violations of the provisions.

In addition to the existing laws listed above, there are permitting processes and related legislation that offer a means to review and prevent potential impacts to these sites. These include the following:

Treatment and Disposition of Human Remains and Burial Furnishings: Created to preserve and protect the historical and cultural resources of Palau and to prevent the undue disturbance and removal of human remains and associated burial furnishings or artifacts. Scholars who conduct research activities in Palau and wish to analyze and/or transport human remains or artifacts outside of the country collected during archaeological excavation must also sign the Agreement for the Disposition of Human Remains in the Republic of Palau and Agreement for Curation of Artifacts, when appropriate.

Historic Clearance Permit: Any activities that require land earthmoving, alteration, or demolition must apply for a Historic Clearance Permit to ensure that cultural properties are not adversely affected.

Palau Lagoon Monument: Under Title 19, specific legislation was passed for the protection of underwater archaeological and historical tangible

remains. As stated in **Chapter 3:**

§302. All ships, other vessels and aircraft, and any and all parts and contents thereof, which formerly belonged to or were part of the armed forces or commercial fleet of Spain, Germany, Japan, the United States or any other nation, which were sunk to or otherwise deposited on the bottom of the Palau Lagoon and its territorial waters, subject to applicable salvage laws, shall be and hereby are set apart as monuments which shall be collectively called the “Palau Lagoon Monument.”

§304. All persons who dive to or by any other means seek and obtain access to the aforesaid ships, [...] for the purpose of examination or the gathering of objects there from, shall first obtain a permit therefore from the President or his duly authorized representatives. The President is authorized to issue such permits to those persons whom he deems qualified to conduct such examination or gathering, subject to such rules and regulations as he may prescribe.

§306. Any person who, without the permission of the President, removes, appropriates, damages, or destroys the aforesaid ships [...] or who violates any rule or regulation issued pursuant to this chapter, shall, upon conviction, be fined not more than \$1000, imprisoned for a period of not more than six months, or both.

Palau National Register: There are currently 36 stonework village and other archaeological sites located in the RISL area listed on the Palau National Register. Registered sites are protected under Title 19. SubChapter IV of Title 19 describes the violations and penalties associated with damaging tangible cultural property:

(a) it shall be unlawful for any person, natural or corporate, to take, appropriate, excavate, injure, destroy, or alter any tangible cultural property listed on, or determined to be eligible for, the Palau Register of Historic Places.

(b) Any person who violates this section shall be fined not more than \$1,000 for each separate offense. If the violator directly or indirectly has caused the loss of, or damage to, registered historical sites or tangible cultural property, the violator shall be fined an additional amount determined by the court to be equivalent to the value of the lost or damaged tangible cultural property.

Title 24 Palau National Code Annotated (24 PNCA) (The Environmental Quality Protection Act):

The Republic of Palau has a substantive environmental policy expressing intent and resolve to protect and enhance the natural environment as a means to safeguard the human environment. The purpose of this act was to establish general standards for environmental review by the Republic of Palau Environmental Quality Protection Board (EQPB). The overall goal is to ensure protection of the environment while making an effort to promote sustainable economic development. The EQPB is responsible for the protection and conservation of the environment.

EQPB regulations are divided into eight sections:

1. Earthmoving;
2. Marine and Freshwater Quality;
3. Toilet Facilities;
4. Solid Waste Management;
5. Pesticides;
6. Public Water Supply Systems;
7. Environmental Impact Statements; and
8. Air Pollution Control.

Impacts on endangered species and their habitats and historic properties are required to be considered by an Environmental Impact Assessment or an Environmental Impact Statement for large scale earth moving projects.

Regulations listing threatened and endangered species are under development. Consideration of impacts on ecosystems and on proposed endangered or threatened species is generally required under Environmental Impact Statement Regulations, Chapter 240 1-6, and Earth Moving Regulations,

Chapter 240 I-I, adopted by the Environmental Quality Protection Board, but the effectiveness of these requirements is undermined by the lack of a formal listing of endangered and threatened species.

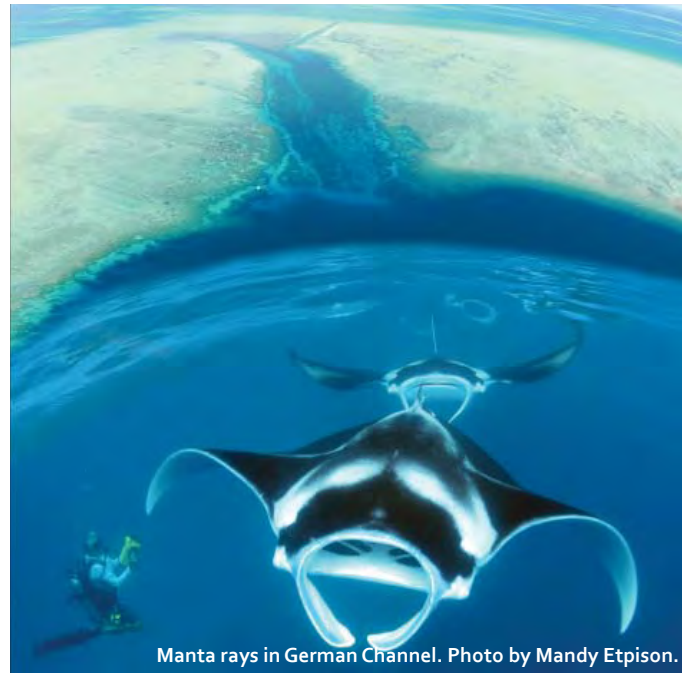
Palau's **Endangered Species Act** prohibits any person from taking, engaging in commercial activity with, possessing, or exporting any endangered or threatened species of plant or animal. The Endangered Species Act was adopted in 1975, but a list of endangered and threatened species has not yet been adopted into regulation. (Kitalong and Kitalong 2007).

Except for four species, all birds in Palau are protected under **24 PNCA § 1401 (Protected Land Life Act)**. The maximum penalty for violation of this section is \$100 and/or six months imprisonment.

Under the statutes establishing the Ngerukewid Islands Wildlife Preserve, the area is to be maintained in a primitive condition, and it is illegal to take or possess weapons, traps, snares, or objects capable of killing or otherwise taking birds, animals, or marine life in the preserve. Possession of birds, animals, marine life or eggs is also prohibited, and transporting or allowing domestic animals or birds into the area is also prohibited, as is lighting of fires or cutting or removing any plant life. There are no civil enforcement provisions however, and the maximum criminal penalties are a \$50 fine and imprisonment for six months, combined with forfeiture of gear (including boats).

Foreign fishing within Palau's 200 mile extended fishery zone is limited by statute under **27 PNCA §§ 101-207**. Foreign fishing is generally prohibited in Palau's territorial sea or internal waters (waters up to three miles from the baseline, encompassing the RISL).

Domestic fishing has statutory limitations under the **Marine Protection Act, 27 PNCA §§ 1201-1211**. These statutory provisions limit the take, sale, purchase, and export of many species and include closed seasons for grouper and rabbit fish,



Manta rays in German Channel. Photo by Mandy Etpison.



Branching coral. Photo by Ron Leidich.



Two species of cardinalfish. Photo by Ron Leidich.

and minimum sizes for parrotfish, wrasse, crabs, and lobster. Gear restrictions such as a prohibition on fishing with SCUBA gear and minimum and prohibitions on certain types and sizes of nets are also included. The Marine Protection Act also restricts the taking of aquarium fish, requires labeling of exports, and authorizes additional regulations to protect certain species from over harvesting (e.g., 27 PNCA §§1205-1207). Violations of the Marine Protection Act are subject to both civil and criminal enforcement. Criminal penalties vary but generally carry minimum penalties of US\$250 to \$500 for first offenses and maximum terms of imprisonment of six months to two years. Civil penalties of up to US\$200,000 per violation may be imposed for violations committed as part of a commercial operation or enterprise.

In 2006, the Palau National Congress passed a total ban on the harvesting of vulnerable Bumphead Parrotfish, *Bolbometopon muricatum*, and endangered Humphead Wrasse, *Cheilinus undulatus* (SB 7-64). This law was reaffirmed in 2010 by a Presidential veto of a new bill that would have opened a fishing season for these species.

Numerous other national laws protect species and habitats, including Republic of Palau Public Laws:

- 4-35, Regulating taking of marine and terrestrial organisms
- 6-28, Increasing penalties on dugong taking
- 6-36, Prohibiting foreign fishing vessels
- 6-39, Creating the Protected Areas Network
- 7-17, Banning bottom trawling
- 7-24, Establishing recycling fund and program
- K8-186-2007, Banning shark feeding

Presidential Declarations established Palau as a Shark Sanctuary and Marine Mammal Sanctuary.

Existing Plans Related to Municipality and Region in which the Proposed Property is Located

The comprehensive “Rock Islands Southern Lagoon Area Management Plan 2004-2008” governs the entire RISL. The Management Plan was adopted by the Koror State Legislature and Governor in 2005. It has been re-authorized while a review is being undertaken.

Property Management Plan or other Management System

The process of developing a management plan for the natural environment and cultural resources of the RISL was long and comprehensive as evidenced in the timeline below. As previously detailed the RISL was historically managed by traditional controls. Although traditional marine tenure no longer exists within the RISL, traditional controls have been maintained and are the basis of many modern day conservation initiatives. For example, a Traditional Decree declared by the Ngarameketti Chiefs Council of Koror in 1973, still restricts harvesting of marine and terrestrial resources in the Rock Islands and the surrounding waters in the Property. Over the years increased tourism and harvesting activity made it apparent that additional laws and programs to enforce the laws were needed and a series of laws and initiatives were created to do so.

The first step towards comprehensive management occurred in 1989, when the Koror State Ranger program began. This was followed by the creation of the Koror State Department of Conservation and Law Enforcement (KSDCLE) in 1994. This further led to the development of State regulations on general resource use, recreational activities, and the designation of protected areas within the RISL.

Since the KSDCLE was established, it has worked closely with a range of locally-based agencies and organizations on management and research activities within the Property. A Rock Islands Use Act (RIUA) regulating tourist activities in the Rock Islands was passed in 1997. Planning for community facilitation and eventual development of a formalized management plan for the natural environment began three years later. Reflecting Palauan traditions of reaching consensus on important decisions, the Management Plan was created through a two-year process that engaged stakeholders at every level. A revised Management Plan will be in effect from 2011 through 2015.

The Rock Islands Southern Lagoon Management Plan 2004-2008 includes Management Objective



Figure 49. Ulong Island cultural site management plan.
Photo Clark/Reepmeyer – ANU



Figure 50. Ulong Island existing cultural site signage.
Photo Clark/Reepmeyer – ANU

presented here has three objectives:

1. By 2014, protocols for maintaining and rehabilitating stonework village sites and features are developed;
2. By 2016, village sites that are in critical need of care or rehabilitation have been identified, mapped and a plan for their rehabilitation developed; and
3. By 2015, 50% of the traditional cheldebechel of Koror have access to information on the importance of the RISL to Koror’s cultural heritage, and value the RISL’s cultural sites.

3.3.2 (Traditional Values): Preserve the traditional, cultural, and recreational values of the Management Area for the people of Koror and Palau.

Proposed cultural sites management plan

Currently there is little to assist visitors in understanding and appreciating Rock Island cultural sites. There is minimal signage and few trails at cultural properties. The majority of tour guides are inadequately trained in historic properties. Whether volume-based or niche-based tourism strategies are adopted by Palau, it is appropriate to develop a management program that protects traditional and historic sites in the RISL from current and future threats.

Revisions to the Management Plan that are currently under review include a specific goal towards preserving and maintain the landscapes, artifacts and oral traditions associated with the stonework village sites in the RISL. The proposed management plan for stonework village sites

Examples of proposed actions that are being incorporated into the revised management plan are given for the stonework village site on Ulong Island and located at Dmasech Island-Uchularois Island.

Ulong Island stonework village

Visitor arrival: Boat access is toward the middle of the western beach where the visitor facilities are located. The access point is 200m northwest of the stonework village remains and is a natural starting point for a visitor’s trail to the prehistoric site (Figure 49).

Proposed Management: Maintain current arrangement.

Facilities: Visitor facilities on Ulong Island consist of an open structure roofed in corrugated iron. Benches and two cooking areas are under the



Figure 51. Along Island example of existing foot path to cultural site.
Photo Clark/Reepmeyer – ANU

roof and a double toilet block is behind the main structure. Benches and tables lie seaward of the roofed structure and the area can comfortably support 30-50 tourists a day. The site is maintained by the Koror State Rangers who run the pioneering Beach Boys program which seeks to help the disadvantaged youngsters of the Koror community and to provide them with opportunities to better themselves. Rangers and Beach Boys regularly clean the visitor site by removing rubbish, servicing toilet facilities, and monitoring the effects of tourist-visitor visits.

Proposed Management: Maintain current arrangement.

Signage - path entry: There are currently signs attached to the main building and on large strandline trees that ask tourists not to cut or burn trees/vegetation, touch corals, handle marine life nor feed sharks. They also state that any rubbish is to be returned to Koror and disposed of properly. Behind the main building, and south of the toilet block, at the start of the trail to the stonework site are two signs mounted on metal supports (**Figure 50**). One sign with text in English, Palauan, and Japanese warns visitors not to relocate or remove any objects from the prehistoric site. This sign is badly damaged and only partially legible. The second sign has text in Palauan explaining the archaeological investigations and significance of the site: that in addition to the stonework village remains there are cultural remains dating to the earliest phase of Palauan history.



Figure 52. Dmasech Island cultural site management plan.
Photo Clark/Reepmeyer - ANU

This sign is covered by a film of green plant/algae material caused by water entering the sign's frame.

Proposed Management: Additional signage is required. On arrival at the visitor structure signage giving information about the cultural site and a map showing the path and position of the prehistoric remains is required (see **Figure 49**, Point 1). At the start of the path a sign should be erected that informs visitors that Palau's cultural heritage is a precious resource, that objects from prehistoric sites are not to be relocated or removed, and that interference with cultural sites is subject to legal penalties (**Figure 49**, Point 2). Signage text would ideally be in several languages (e.g., Palauan, English, Chinese, Japanese).

Pathway: The path to the stonework site follows the contact between the sand plain and the rubble-edged limestone slope of the island (**Figure 49**).

Vegetation along the path has been periodically cleared as have trees and scrub around the large defensive wall so that the aspects of the stonework and site layout can be seen. The foot path goes over midden remains and there are several prehistoric entrances in the wall that are partially filled with wall rubble. Inside the wall the ground surface is covered with numerous small fragments of limestone rubble and midden remains (marine shellfish and pottery). There is a dense surface scatter of shell tools and one tourist operator has hidden tools inside stonework so that the artifacts would not be fossicked. There is a faint trail into the limestone, but it has not been cleared of vegetation, marked, or cleared of slope debris.

Proposed Management: The current path from the visitor structure to the defensive wall is to be outlined and built up with 10-15cm of sand and edged with the limbs and trunks of shrubs/trees cut during path clearance (**Figure 49**, red line; **Figure 51**). A 3-5m area bordering the defensive wall and cleared of vegetation is required so that the entire structure and construction details can be seen. The entrance to the pathway is to be marked by a small structure equipped with signage that provides general information about stonework villages and their abandonment (**Figure 49**, Point 2). A raised wooden walkway over the entrance way and across the interior of the site would reduce damage to the site's surface material remains and architectural features such as the raised foot bank and buried coral head near the main entrance (**Figure 49**, blue line). A short section of trail up the limestone slope to several stonework features could be delineated by clearing vegetation and debris and installing trail markers.

Signage - site interpretation: There is no signage at the stonework village. This limits visitor understanding and makes it difficult to appreciate the cultural significance of the prehistoric remains.

Proposed Management: Signage in addition to that placed at the start of the trail to be located at Points 3, 4 and 5 (**Figure 49**). Point 3 is the main entrance to the defended part of the stonework village and there are intact

sections of wall to the north, and large limestone foundation blocks to the south. Signage could outline the defensive aspect of the site and describe the material remains visible on the ground surface, particularly the marine food remains that point to over exploitation of the local environment. Inside the wall, signage information could include the traditional history of the site and migration sequence of the Ulong people. The oldest prehistoric site dating to 3000 years ago is within the wall area and the use of the Rock Island's marine resources at this time could be reported. At Point 5 on the limestone slopes, signage outlining the broader stonework village system that extends into the harsh interior of the Rock Islands could be mentioned to emphasize the marginal environmental conditions experienced in prehistoric Rock Island villages.

Dmasech Island-Uchularois Island stonework village

Compared to Ulong Island the stonework village remains on Dmasech Island-Uchularois Island are more complicated. Not only do the remains extend over two islands but the site components illustrate different aspects of the village system (**Figure 52**). On Uchularois Island the stonework remains are located on elevated terraces which oral traditions record as the chiefly structures of the Paramount Chief Uchelmelis. The stone structures on nearby Dmasech Island are distributed along a low ridge of limestone in the central part of the island; a location which appears to be chosen for community security. Access to Dmasech Island-Uchularois Island is prohibited for tourists. Restricted visitor access is allowed.

Visitor arrival: There are beaches with visitor access on the north, and east-central side of Dmasech Island. A tombola connects Dmasech Island to Uchularois Island where there is a derelict visitor structure and amenities. Access to the cultural sites from the east-central beach is recommended.

Proposed Management: Maintain current arrangement with visitor arrival at Point 1 (**Figure 52**).

Facilities: On Uchularois Island there is a visitor-dormitory structure dating to the 1970-1980s (now in disrepair) on the small sand plain on the southwest of the island (**Figure 20**). Amenities such as a water tank, toilets, showers, and cooking facilities were placed around the structure and on the terrace above. These facilities are no longer used as there is another visitor area a short distance to the west on Dmasech Island. Visitor facilities on Dmasech Island's east-central beach consist of a large corrugated roofed and walled structure. Surrounding the structure are tables, benches, cooking areas, a toilet block, and refuse areas. The site is regularly maintained by the Koror State Rangers and participants in the Beach Boys program.

Proposed Management: Removal of the visitor structure and amenities on Uchularois Island to be undertaken (**Figure 52**, Point 2). The site returned to its natural state so that the remains of the prehistoric stonework village system that spanned the two islands can be connected by a single pathway.

Signage - path entry: There is currently no signage giving information about the cultural sites on Uchularois and Dmasech Islands. There are currently signs attached to the main building and on large strandline trees that ask tourists not to cut or burn trees/vegetation, touch corals, handle marine life nor feed sharks. They also state that any rubbish is to be returned to Koror and disposed of properly.

Proposed Management: Signs placed at Point 1 (**Figure 52**) to introduce the stonework village system and provide a map showing the trail position in relation to the two islands. At the start of the path position another sign informing visitors that Palau's cultural heritage is a precious resource, that objects from prehistoric sites are not to be relocated or removed, and that interference with cultural sites is subject to legal penalties (**Figure 52**, Point 1). Signage text would ideally be in several languages (e.g., Palauan, English).

Pathway: There is currently no pathway connecting the two sets of prehistoric remains.

Proposed Management: A path built up with 10-15cm of sand and edged with the limbs and trunks of shrubs/trees cut during path clearance (**Figure 52**, red line) to extend westward on Dmasech Island from Point 1 to Point 6 (**Figure 52**) and on Uchularois Island from Point 2 eastward to the path end. The tombola linking the two islands is swept by waves and eroded during high tides and storms, and a track on it is not required. A raised walkway may be necessary to cross a low lying section of sand edging the limestone ridge between Point 4 and Point 6. The section of sand can be wet and boggy at high tide. The path in the limestone terrain between Point 5 and Point 6 on Dmasech Island and east from Point 2 on Uchularois Island is to be cleared of vegetation and the trail clearly marked. On Uchularois Island there are some steep sections of limestone that may require modification to allow safe access.

Signage - site interpretation: There is no signage at either of the stonework village sites which limits visitor understanding of the sites and an appreciation of the cultural significance of the prehistoric remains.

Proposed Management: Additional signage to that placed at the start of the trail to be placed at Point 3 on Uchularois Island and Points 4, 5 and 6 on Dmasech Island (**Figure 52**). Point 3 is the small sand plain at the base of Uchularois Island which is to have existing structures cleared from it. Signage at Point 3 could mention that in traditional history the island was the residence of Uchermelis, the high chief of the Ngemelis Group, who defeated the people from the stonework village on Ulong Island causing island abandonment. Text might also draw attention to the large foundations of a canoe dock or breakwater in the intertidal zone and describe the platform and physical remains at the path terminus. Also of note is the significance of faunal remains from Uchularois Cave which show a decrease in size over time indicating over-harvesting of marine resources during the stonework village phase.

At Point 4 a large rubble foundation on the sand plain is likely the remains of a community structure (bai); one of the few present in the Rock Islands. Signage text could explain the continuing significance of bai to Palauan society. A low lying strip of sand east of the limestone ridge at Point 5 provides a vantage point to observe the stone structures and ridge modification including terraces, walls and platforms. On the ridge signage at a prehistoric well site (**Figure 52**, Point 6) could emphasize the difficulties faced by the inhabitants in obtaining sufficient potable water and the importance of fresh water wells as seen from the density of marine shellfish and pottery remains surrounding it.

5.f - Sources and levels of finance

The Koror State Government has consistently funded management of the RISL, indicating its stability and commitment to the preservation of the resources within state waters. The Koror State Department of Conservation and Law Enforcement (KSDLE) receives an annual budget from the Koror State Government. During the 2010 budget year, KSDLE was allocated a budget of over US\$900,000 to pay for staff and implement the following additional programs:

- Compliance Program- a capacity and training program for Koror State Rangers.
- Rock Islands Facelift Program - a program focused on maintaining the tourist areas within the RISL, which includes funding for the Beach Boys (described in section 5.j), construction and maintenance of visitor amenities, and the marine lakes monitoring program.
- Marine Tour Guide Certificate Training Program - a capacity building program designed to develop a standard for tour guides in the marine recreation industry. In 2011 participation in this program by all marine tour guides operating in Koror State waters was mandated by law.

An additional US\$100,000 in special projects was committed to the Management Area in 2010. Supplemental support in the form of financial and

technical assistance comes from a variety of local, regional and international organizations. The 2010 budget details current and ongoing programs in the RISL and is available in **Appendix H**.

Funding for the RISL is mandated by law. The 2009 Rock Island Conservation Act (K9-207-2009) specifically earmarks revenues collected from RISL use permits to be used for the management, maintenance, and monitoring of the property. K9-221-2010 established an emergency fund derived from three percent of revenues collected from Rock Island and Jellyfish Lake visitor permits. These funds are placed in a special account to be used only for mitigating natural disasters and emergencies.

5.g - Sources of expertise and training on conservation and management techniques

In addition to its competent and dedicated staff, Koror State collaborates with experts from a number of national agencies, and international, regional, and local non-governmental organizations and agencies to implement activities, source expertise, and identify and implement best practices. Some organizations that partner with Koror State on conservation activities are below.

National Government Agencies

- The Bureau of Marine Resources is the main government agency responsible for development and management of Palau's marine resources. This bureau recommends and reviews national regulations and legislations and monitors marine species populations in Palau's waters.
- The Bureau of Agriculture partners in assessing and mitigating the effects of invasive species. Its Division of Forestry works on terrestrial issues.
- The Bureau of Public Safety is the main Bureau charged with enforcing national laws. As such they have enforcement jurisdiction over all areas of Palau.
- The Office of the Palau Automated Land and Resource Information Systems (PALARIS) is the local apex for GIS technology. PALARIS has assisted Koror State with geo-mapping the RISL. They also

are an active partner with mapping coral reef monitoring sites.

- The Bureau of Arts and Culture assists with cataloguing, registering, and restoring cultural and historical sites.
- The Division of Cultural Affairs under the Ministry of Community and Cultural Affairs protects cultural traditions through collection of oral and written histories and education.

Local Community-Based and Semi-Government Agencies

- The Palau International Coral Reef Center (PICRC) is a semi-governmental agency. PICRC conducts research and conducts education about the ecological, economic, and cultural importance of coral reefs through trainings, workshops, and conferences. They conduct bi-annual coral reef monitoring in the RISL. www.picrc.org
- The Palau Visitors Authority is a semi-autonomous entity working to support and encourage the development and marketing of tourism as a primary economic sector in Palau. They are one of the main agencies promoting the RISL area as a pristine tourist destination. www.visit-palau.com
- Palau Community College (PCC) offers programs in Marine Science Education,

Environmental Education, and Tourism and Hospitality. <http://www.palau.edu/>

- The Belau National Museum is a semi-governmental organization whose mission is to stimulate interest in culture and the arts by undertaking marketing, effective research, documentation, collection and presentation of culture, artifacts, natural history, and the development of activities. The museum is mandated to conduct National Bird Monitoring. www.belaunationalmuseum.org
- The Environmental Quality Protection Board (EQPB) is a semi-governmental organization responsible for preserving and protecting the environment in Palau. They issue permits for activities that involve earthmoving and other activities that could potentially impact the environment.
- Palau Conservation Society (PCS) is a non-profit organization that “works with the community to preserve the nation’s unique natural environment and perpetuate its conservation ethic for the economic and social benefit of present and future generations and for the enjoyment and education of all.” www.palauconservation.org
- The Belau Tourism Association (BTA) is a consortium of local tour operators and representatives from various tourism sector businesses.



Employees from a Rock Island Tour Company pose with their marine tour guide certificates after conclusion of the 2007 course. Photo courtesy of KSDCLE.

- The Coral Reef Research Foundation (CRRF) is a local non-profit organization focused on increasing knowledge of coral reefs and other tropical marine environments through basic and applied marine research, with special emphasis on species diversity work, collection for biomedical screening, environmental monitoring, reef fish spawning biology, and innovative development of new techniques for marine research work. They collect data within the RISL. Of note is their long-term data series on the marine lakes. www.coralreefresearchfoundation.org

International Organizations

- The Nature Conservancy (TNC) provides expertise on coral reef conservation, management of protected areas and community participation on managing the RISL. They conducted a midterm evaluation of the 2004-2008 Management Plan and conducted planning processes for revisions of the Management Plan. <http://www.nature.org/wherewework/asiapacific/micronesia/work/palau.html>

5.h - Visitor Facilities and Statistics

The majority of Palau's annual visitors visit the RISL. During the years from 2006-2009, an average of 84 percent of visitors to Palau obtained permits to visit the RISL (**Figure 53**).

As detailed in section Section 5.c, there are numerous areas throughout the RISL of Koror State. Tourist areas often have benches, shaded shelters, charcoal grills, and composting toilets. Koror State works with tour operators to promote environmentally friendly tourism, and offers a tour guide course and certification. The first tour guide courses were held in 2007. A January 2011 law mandated tour guide training and certification.

There are numerous tour operators offering services to tourists who want to visit the natural areas and cultural sites of the RISL of Koror State. Tourists can choose between the many group tours or arrange charter trips. While diving is the

predominant pastime for tourists to the RISL, there are many other activities available such as snorkeling, kayaking, stand up paddling, hiking, and boat, fishing, and historical site tours. Koror has an abundance of lodging options for visitors to the RISL, from small budget hotels and motels to large luxury hotels. Camping is permitted in certain areas in the RISL of Koror State, but permits are required. The majority of tourists spend the day in the RISL and return to the town of Koror to spend the night, but some participate in overnight kayaking and camping tours in the RISL. There are also live aboard vessels anchored at designated sites with the RISL.

5.i - Policies and programs related to the presentation and promotion of the property

While the Koror State Department of Conservation and Law Enforcement (KSDLE), does not receive funding specifically dedicated to promoting the RISL, they are heavily engaged in their community and promote and protect the property through their work. The presence of Koror State Rangers at events occurring in or adjacent to the RISL helps ensure that the events are conducted in an environmentally responsible fashion.

Much of the international promotion of Palau as a tourism destination is accomplished by the Palau Visitors Authority (PVA). While the PVA's marketing efforts focus on all of Palau, the Rock Islands are an integral component to PVA's marketing campaign. Images of the Ngerukewid Islands Wildlife Preserve frequently serve as a photographic backdrop in marketing materials. In addition to marketing Palau to tourists, an important component of PVA's work is to generate support for tourism within Palau by raising awareness among the local population about tourism and its impact on the nation.

Through the promotion of research and activity in community engagement and education, PICRC is an ardent promoter of the RISL area of Koror State. Although PICRC is focused on the entire nation of Palau, the RISL area of Koror State is a critical focal point of their work. In addition to coral reef monitoring activities within the RISL, some of

their most important work is with Palauan youth. Throughout the year, PICRC staff visit classrooms and teach children about their environment, including the RISL, and stress the importance of protecting it. PICRC offers summer programs, including a week long camp and an aquarium overnight experience, that allow youth to develop a richer understanding of the biodiversity in the RISL. PICRC also tracks socioeconomic conditions, including cultural values and attitudes towards the RISL.

Other agencies in Palau also provide promotional and educational information about places within the RISL. For example, CRRF produced an information sheet on Ongeim'l Tketau which explains its history and how to behave in and around the lake in order to maintain and preserve it.

5.j - Staffing levels

The mission of the KSDCLE is to work with the public to build community support and trust, to preserve peace and maintain order, and to develop and implement a comprehensive management plan for the RISL. The staff members of the KSDCLE are dedicated to the protection and preservation of the Rock Islands Southern Lagoon. **Table 16** shows the overall staffing structure and numbers for the

department, which is managed by a Director and also includes the following programs and positions:

- The Ranger Program includes Senior Rangers, Patrol Captains, Rangers, and Conservation Rangers. This department includes trained, ranked and uniformed rangers who maintain law and order, as well as preserve the unique natural resources of the State.
- The Rock Island Face Lift Program (Beach Boys) program trains at-risk youth to maintain tourist areas in the RISL, provides critical job opportunities and encourages environmental stewardship.
- The Coastal Resources Management Officer focuses on the development and implementation of the Management Plan and related programs. In January 2012 this position was vacant.

The Rock Islands Southern Lagoon is proposed for inclusion on the World Heritage list based on of its cultural sites of importance, unique and thriving biodiversity, and excellent conservation status and management. This monitoring plan is based partially on that in the Management Plan and partially on the information presented in this nomination dossier.

Figure 53. Comparison between the number of RISL permits issued and the number of visitors to Palau (PVA 2010; Koror State 2010)

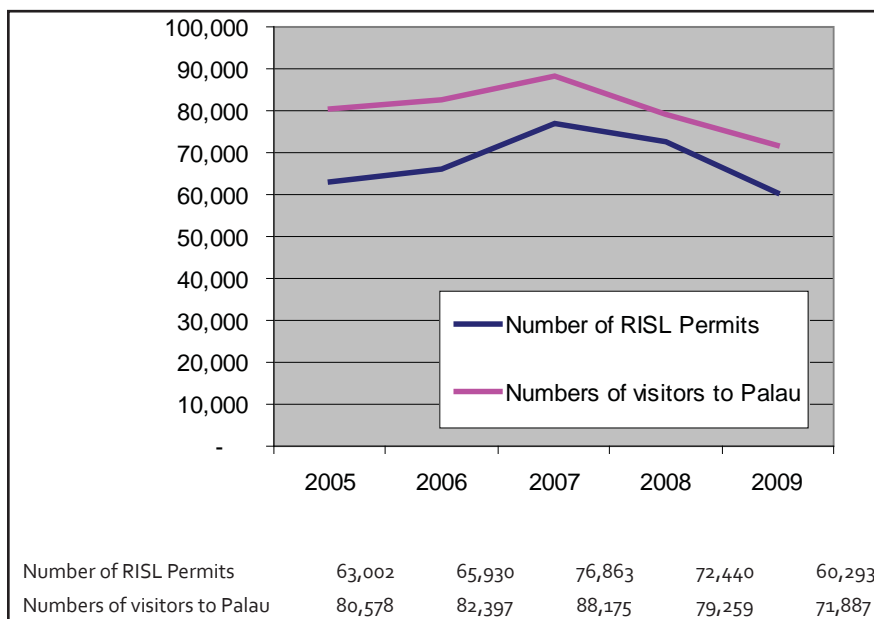


Table 16: Department of Conservation and Law Enforcement Staff

Title	#
Director	1
Secretary	1
Rangers	23
Conservation Rangers	2
Beach Boys	15
Rock Islands Development/PR Officer	1
Quality Control Officer	1
Marine Education/Coastal Management Assistant (Taiwan ICDF Volunteer)	1
Office Assistant	1
Security Guards	5
Boat Mechanic	1
TOTAL	52

A visit with a visiting researcher

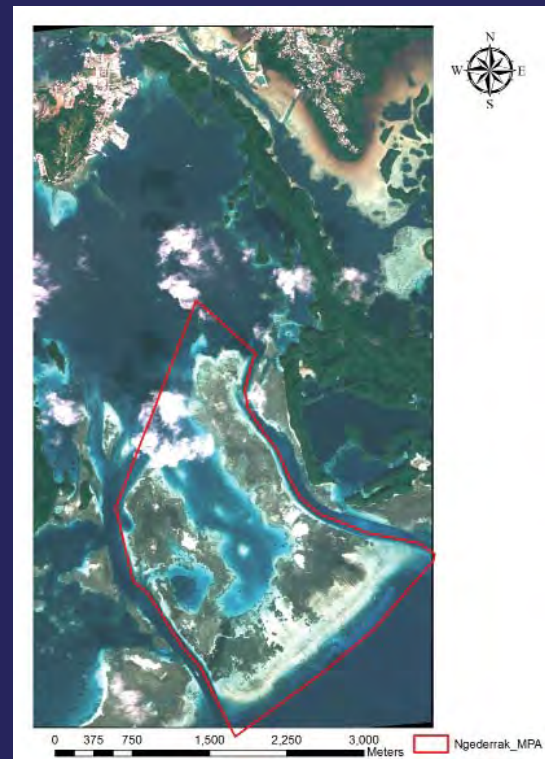
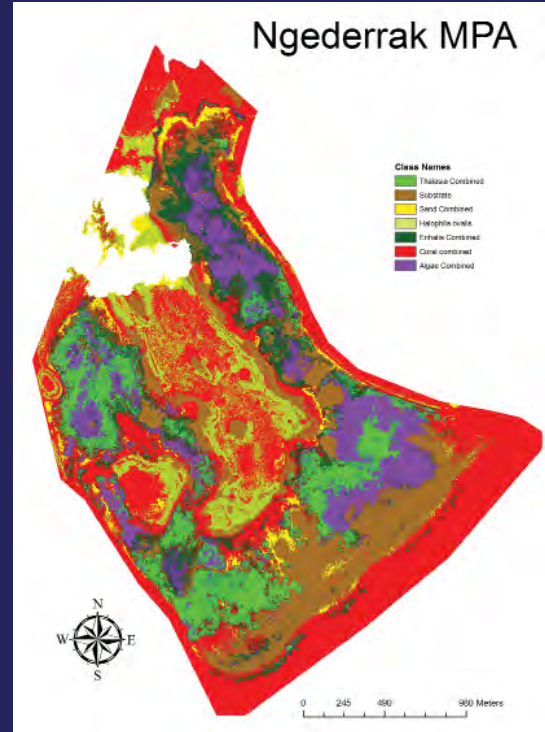
The Rock Islands are a popular location for local and international researchers. Their contributions contribute to a better understanding of the RISL, improving management and monitoring.

Paul Collins, a Graduate Student from the United Kingdom, discussed his 2009 research on Ngederrak Reef.

" My recent survey aimed to map the benthic habitat types for the entire Ngederrak Reef Marine Protected Area (MPA; fully within the RISL) using very high resolution satellite imagery in combination with LIDAR data, differential GPS and extensive ground truthing. The ground truthing required me to visit over 300 individual locations and classify the habitat type (i.e., coral, sand, substrate, *Halophila ovalis*, etc.) and to document the habitat through photography. The 300+ sites each now have highly accurate GPS location data which allows them to be revisited in the future, essentially making them permanent monitoring sites. This will allow Koror State to establish any changes that may occur on the reef and to direct any future monitoring and research. The results of the monitoring and the habitat map produced will serve as a baseline from which future changes to habitat type can be monitored as well as enable examination of the changes that may have occurred over the past 10 years by comparing the new imagery with past imagery for the same area."



An aerial view of Ngederrak Reef.



Photos by Paul Collins.

6. Monitoring

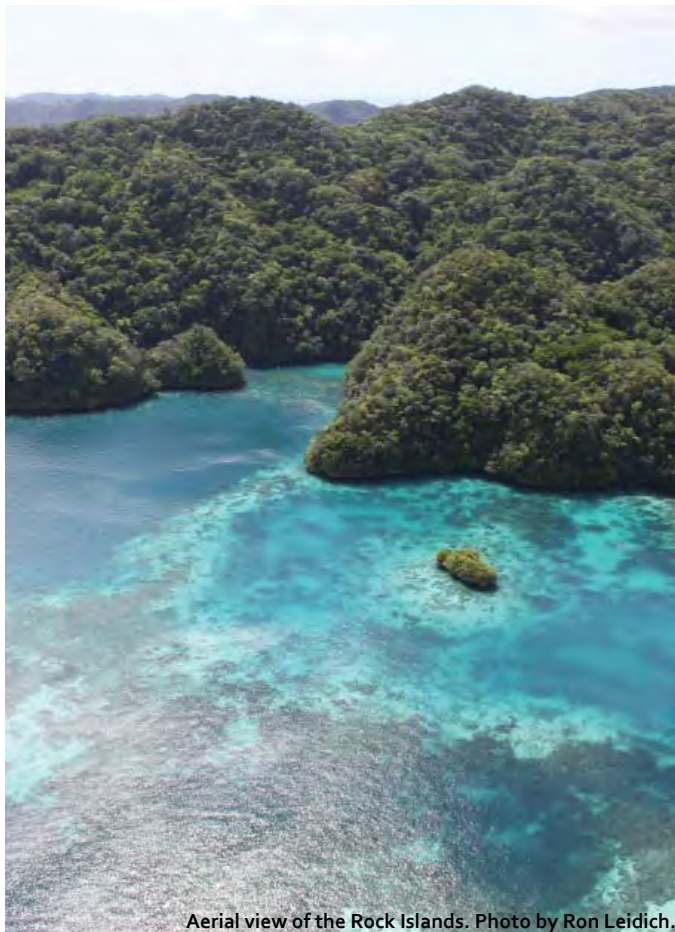
6.a Key Indicators for measuring state of conservation

See Table 17.

6.b Administrative arrangements for monitoring property

Koror State has ultimate responsibility for maintaining the RISL and monitoring it. Monitoring is conducted through the Koror State Ranger program and through national partnerships which are detailed below.

- PALARIS maintains spatial records, including current satellite imagery.



Aerial view of the Rock Islands. Photo by Ron Leidich.

- Palau International Coral Reef Center (PICRC) conducts the National Coral Reef Monitoring Program for Palau. The RISL is a part of the area that is monitored.
- The nongovernment Coral Reef Research Foundation (CRRF) monitors Palau's marine lakes and conducts research on coral reefs in the RISL.
- The Ministry of Natural Resources, Environment, and Tourism includes the Division of Forestry and Bureau of Marine Resources, both of which have national mandates to monitor forest health and marine resources (such as sea turtles).
- The Belau National Museum is mandated by Presidential Proclamation to monitor birds and produce a yearly "State of the Birds" Report.
- The Palau Environmental Quality Protection Board (EQPB) conducts water quality monitoring.
- The Division of Cultural Affairs under the Ministry of Community and Cultural Affairs is mandated with maintaining information on cultural sites and artifacts.

6.c Results of previous reporting exercises

There have been numerous publications describing aspects of cultural sites and the natural environment of the RISL of Koror State. The following list of references includes relevant previous research studies and monitoring activities in the Property, including published scientific articles, management plans, reports, maps and pamphlets. Although the list is focused on reports detailing the state of conservation within the RISL of Koror State, it also includes surveys and reports with a broader scope if they also include the Property.

Table 17. Key Indicators for measuring state of conservation

Indicator	Periodicity	Location of records
Biophysical Status		
Coastal habitat coverage (km ²)	Ground truthing/spot checks annual	PALARIS, PICRC
Forest cover (km ²)	Ground truthing/spot checks annual	PALARIS
Marine lake species (list of species)	Annual	CRRF
Marine lake species (# jellyfish / area)	Annual	CRRF
Extent invasive species in marine lakes (# species / area)	Annual	CRRF
Reef substrate/Benthic community structure (% cover)	Annual	PICRC
Coral recruitment (#/area)	Annual	PICRC
Fish species (# species / area)	Annual	PICRC
Fish abundance (# / area)	Annual	PICRC
Sea turtles (# / area)	Annual	PICRC
Sea turtle nesting sites (# sites)	Every five years	MNRET
Crocodiles (#)	Every five years	Koror State
Dugong (#)	Every five years	Koror State
Fruit Bats (# / station)	Annual	BNM
Birds (# / station)	Annual	BNM
Plants (# <i>Ponapea</i>)	Annual	MNRET
Water quality (turbidity, nutrients)	Annual	EQPB
Cultural Site Integrity		
# / % sites documented / inventoried	Annual	Koror State / BAC
Presence / absence of documented removable artifacts	Annual	Koror State / BAC
% sites restored	Annual	Koror State / BAC
% sites with documented visitor damage	Annual	Koror State
% sensitive sites with restricted access	Annual	Koror State
Socioeconomic Status		
Perception of resource (% categorization)	Every five years	Koror State
Resource use patterns	Every five years	Koror State
% Buy-In	Every five years	Koror State
Household income distribution by source	Annual	Office of Statistics
# Visitors	Monthly	Koror State
Threats		
Invasive species (presence/absence, #)	Annual	Koror State
Visitor impacts	Annual	Koror State
Management Effectiveness		
Level of funding	Annual	Koror State
# Staff / # empty staff positions	Annual	Koror State
# citations	Annual	Koror State
Presence / absence authorized management plan	Annual	Koror State

6.c Results of previous reporting exercises - List of references

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7. Documentation

7a. Photograph, Image Inventory and other Audiovisual Materials Authorization Table (listed in order of appearance in dossier)

Photograph, Image Inventory and other Audiovisual Materials Authorization Table							
Id. No	Format	Caption/Description	Date	Photographer	Copyright owner (if different than photographer)	Contact Details of Copyright Owner	Non-exclusive cession of rights
Photograph 1	JPEG	Rock Islands Southern Lagoon	2010	Mandy Etpison		etpison@palaunet.com	1
Photograph 2	JPEG	Ngerukewid Islands National Wildlife Preserve	2010	Patrick L. Colin / Coral Reef Research Foundation		crrf@palaunet.com	2
Figure i	JPEG	MAP of RISL - Descriptive	2012	Koror State Department of Conservation and Law Enforcement (KSDCLE)		coastalmgnt@kororstate.org	YES
Photograph 3	JPEG	An aerial view of the Rock Islands	2010	Ann Kitalong / The Environment, Inc (TEI) .		kitalong@palaunet.com	YES
Figure 1	JPEG	MAP of RISL - Descriptive	2012	KSDCLE		coastalmgnt@kororstate.org	YES
Figure 2	JPEG	Map of RISL - Coordinates	2012	KSDCLE		coastalmgnt@kororstate.org	YES
Figure 3	JPEG	Map of NE corner of RISL	2012	KSDCLE		coastalmgnt@kororstate.org	YES
Figure 4	JPEG	Nautical Chart of the RISL	2011	KSDCLE		coastalmgnt@kororstate.org	YES
Photograph 4	JPEG	Islands, reef flats, and marine habitats in RISL	2009	Patrick L. Colin		crrf@palaunet.com	2
Photograph 5	JPEG	Marine Biodiversity	2009	Kevin Davidson		pcs@palaunet.com	4
Photograph 6	JPEG	Ongeim l'Tketau (Jellyfish Lake)	2008	Patrick L. Colin		crrf@palaunet.com	2
Photograph 7	JPEG	<i>Mastigias papua etpisoni</i>	2008	Michael N. Dawson		crrf@palaunet.com	2
Photograph 8	JPEG	Coral reef	2010	Palau Conservation Society (PCS)		pcs@palaunet.com	4
Photograph 9	JPEG	Terrestrial biodiversity	2010	Tarita Holm		tarita_holm@yahoo.com	5
Photograph 10	JPEG	Extensive <i>Turbinaria reniformis</i> colonies at Ulong Island	2009	Paul Collins		paul@absolutediving.co.uk	6
Photograph 11	JPEG	Grey Reef Shark	2009	Paul Collins		paul@absolutediving.co.uk	6
Photograph 12	JPEG	Hawksbill Sea Turtle	2009	Paul Collins		paul@absolutediving.co.uk	6
Photograph 13	JPEG	Emerald Skink	2010	Eric VanderWerf		pcs@palaunet.com	4
Photograph 14	JPEG	Micronesian megapode	2010	Mandy Etpison		etpison@palaunet.com	1
Photograph 15	JPEG	Dugongs	2010	Mandy Etpison		etpison@palaunet.com	1
Photograph 16	JPEG	Dugong feeding trail	2009	Paul Collins		paul@absolutediving.co.uk	6
Photograph 17	JPEG	Palau Fruit bat	2009	Mandy Etpison		etpison@palaunet.com	1
Photograph 18	JPEG	Land Snail	2009	PCS		pcs@palaunet.com	4
Photograph 19	JPEG	<i>Hydriastele palauensis</i>	2010	Ann Kitalong		kitalong@palaunet.com	YES
Photograph 20	JPEG	Netfishing for reef fish	2010	Ann Kitalong		kitalong@palaunet.com	YES
Photograph 21	JPEG	A researcher at an entrance to Oasis Lake	2010	Ron Leidich/ Planet Blue Sea Kayak Tours		Planetblue@palaunet.com	10
Photograph 22	JPEG	<i>Pachyseris</i> coral baskets	2010	Ron Leidich		Planetblue@palaunet.com	10
Photograph 23	JPEG	A tunnel leading to Einstein's Garden	2010	Ron Leidich		Planetblue@palaunet.com	10
Photograph 24	JPEG	Corals in Einstein's Garden	2010	Ron Leidich		Planetblue@palaunet.com	10
Photograph 25	JPEG	<i>Synchiropus splendidus</i>	2010	Ron Leidich		Planetblue@palaunet.com	10
Photograph 26	JPEG	Mandarin Fish Cove from the air	2010	Ron Leidich		Planetblue@palaunet.com	10

Photograph, Image Inventory and other Audiovisual Materials Authorization Table							
Id. No	Format	Caption/Description	Date	Photographer	Copyright owner (if different than photographer)	Contact Details of Copyright Owner	Non-exclusive cession of rights
Figure 5	JPEG	Location of cultural sites detailed in this dossier	2011	KSDCLE		coastalmgnt@kororstate.org	YES
Figure 6 - Aerial Map	JPEG	Ulong Island archaeological sites and tourist facilities.	2010	Geoffrey Clark & Christian Reepmeyer/Australia National Univerity (ANU)		geoffrey.clark@anu.edu.au	7
Figure 7	JPEG	Ulong stonework village features.	2010	Clark & Reepmeyer		geoffrey.clark@anu.edu.au	7
Figure 8 - Photo	JPEG	Ulong stonework village defensive wall.	2010	Geoffrey Clark		geoffrey.clark@anu.edu.au	7
Figure 9 - Drawing	JPEG	Ulong Antelope survivor camp AD 1783.	1788	Keate 1789: facing p.127	National Library of Australia	National Library of Australia (61-02-6262-1421)	8
Figure 10 - Map	JPEG	Ulong investigations at the Antelope survivor camp.	2010	Clark & Reepmeyer		geoffrey.clark@anu.edu.au	7
Figure 11 - Photo	JPEG	Ulong red-painted rock art.	2011	Mark Willis		mwillis@blantonassociates.com	11
Figure 12 - Photo	JPEG	Ulong red-painted rock art in fissure.	2011	Mark Willis		mwillis@blantonassociates.com	11
Figure 13 - Photo	JPEG	Ulong rock art in cave interior.	2011	Mark Willis		mwillis@blantonassociates.com	11
Figure 14 - Photo	JPEG	Ulong graffiti over rock art.	2010	Geoffrey Clark		geoffrey.clark@anu.edu.au	7
Figure 15 - Aerial Map	JPEG	Dmasech Island archaeological sites and tourist facilities.	2010	Clark & Reepmeyer		geoffrey.clark@anu.edu.au	7
Figure 16 - Map	JPEG	Dmasech stonework features.	2010	Clark & Reepmeyer		geoffrey.clark@anu.edu.au	7
Figure 17 - Photo	JPEG	Dmasech stonework F-5A.	2010	Geoffrey Clark		geoffrey.clark@anu.edu.au	7
Figure 18 - Photo	JPEG	Dmasech stonework (A) F-18; (B) coral slab and volcanic stones.	2010	Geoffrey Clark		geoffrey.clark@anu.edu.au	7
Figure 19 - Map	JPEG	Uchularois Island archaeological sites and tourist facilities.	2010	Clark & Reepmeyer		geoffrey.clark@anu.edu.au	7
Figure 20 - Photo	JPEG	Uchularois tourist facility (to be removed).	2010	Geoffrey Clark		geoffrey.clark@anu.edu.au	7
Figure 21 - Map	JPEG	Uchularois Cave and excavations.	2010	Clark & Reepmeyer		geoffrey.clark@anu.edu.au	7
Figure 22 - Aerial Map	JPEG	Ngeruktabel Island, Chomedokl Island and Ngeremdiu.	2010	Clark & Reepmeyer		geoffrey.clark@anu.edu.au	7
Figure 23 - Map	JPEG	Ngeruktabel Island traditional village sites.	2010	Clark & Reepmeyer		geoffrey.clark@anu.edu.au	7
Figure 24 - Map	JPEG	Mariar stonework village.	2010	Clark & Reepmeyer		geoffrey.clark@anu.edu.au	7
Figure 25 - Map	JPEG	Mariar F-27 complex.	2010	Clark & Reepmeyer		geoffrey.clark@anu.edu.au	7
Figure 26 - Map	JPEG	Mariar F-7 platform.	2010	Clark & Reepmeyer		geoffrey.clark@anu.edu.au	7
Figure 27 - Map	JPEG	Mariar F-33 complex.	2010	Clark & Reepmeyer		geoffrey.clark@anu.edu.au	7
Figure 28 - Photo	JPEG	Big Mariar defensive wall in the 1970s.	1979 (Top) 2010 (Bottom)	Bruce Masse (Top) Clark & Reepmeyer (Bottom)		wbmasse@lanl.gov geoffrey.clark@anu.edu.au	9 7
Figure 29 - Map	JPEG	Ngeremdiu stonework and Japanese WWII features.	2010	Clark & Reepmeyer		geoffrey.clark@anu.edu.au	7
Figure 30 - Photo	JPEG	Oimaderuul Beach refurbished stone well.	2010	Geoffrey Clark		geoffrey.clark@anu.edu.au	7
Figure 31 - Photo	JPEG	Ngeremdiu Yapese stone money (F-3).	2010	Geoffrey Clark		geoffrey.clark@anu.edu.au	7
Figure 32 - Map	JPEG	Ngeanges Island archaeological sites and tourist facilities.	2010	Clark & Reepmeyer		geoffrey.clark@anu.edu.au	7

Photograph, Image Inventory and other Audiovisual Materials Authorization Table							
Id. No	Format	Caption/Description	Date	Photographer	Copyright owner (if different than photographer)	Contact Details of Copyright Owner	Non-exclusive cession of rights
Figure 33 - Map	JPEG	Ngeanges stonework features on southern outcrop	2010	Clark & Reepmeyer		geoffrey.clark@anu.edu.au	7
Figure 34 - Map	JPEG	Chomedokl Island burial cave.	2010	Clark & Reepmeyer		geoffrey.clark@anu.edu.au	7
Figure 35 - Photo	JPEG	Chomedokl north cave entrance.	2010	Geoffrey Clark		geoffrey.clark@anu.edu.au	7
Figure 36 - Map	JPEG	Chomedokl cave plan.	2010	Clark & Reepmeyer		geoffrey.clark@anu.edu.au	7
Photograph 27	JPEG	Stone platform above the Ulong Village Site.	2011	Ron Leidich		Planetblue@palaunet.com	10
Photograph 28	JPEG	Stone money	2011	Ron Leidich		Planetblue@palaunet.com	10
Figure 37 - Graph	JPEG	Rock Island radiocarbon dates and cultural phases.	2010	Clark & Reepmeyer		geoffrey.clark@anu.edu.au	7
Photograph 29	JPEG	KSDCLE	2010	KSDCLE		coastalmgnt@kororstate.org	3
Painting 1	Scan	Dugongs in legends	2010	Adora Hideo	PCS	pcs@palaunet.com	4
Photograph 30	JPEG	The stunning Rock Islands	2010	Patrick L. Colin		crff@palaunet.com	2
Photograph 31	JPEG	Ulong rock art enhanced to show detail	2011	Mark Willis		mwillis@blantonassociates.com	11
Photograph 32	JPEG	Stone money	2010	Geoffrey Clark		geoffrey.clark@anu.edu.au	7
Photograph 33	JPEG	Stone wall	2011	Ron Leidich		Planetblue@palaunet.com	10
Photograph 34	JPEG	Traditional canoe		Mandy Etpison		etpison@palaunet.com	1
Photograph 35	JPEG	Rock art inside a cave	2011	Mark Willis		mwillis@blantonassociates.com	11
Photograph 36	JPEG	Beach Scene	2010	Paul Collins		paul@absolutediving.co.uk	6
Photograph 37	JPEG	Nudibranch	2010	Paul Collins		paul@absolutediving.co.uk	6
Photograph 38	JPEG	Palau Flycatcher	2005	E. VanderWerf	PCS	pcs@palaunet.com	4
Photograph 39	JPEG	Spadefish	2010	Paul Collins		paul@absolutediving.co.uk	6
Photograph 40	JPEG	<i>Mastigis papua etpisoni</i>	2010	Patrick L. Colin		crff@palaunet.com	2
Photograph 41	JPEG	Endemic <i>Nautilus belauensis</i>	2010	Patrick L. Colin		crff@palaunet.com	2
Photograph 42	JPEG	<i>Astrosarkus idipi</i>	2010	Patrick L. Colin		crff@palaunet.com	2
Photograph 43	JPEG	Subsistence fishing	2006	PCS		pcs@palaunet.com	4
Photograph 44	JPEG	Students hug Finny the Shark during outreach visit	2006	PCS		pcs@palaunet.com	4
Photograph 45	JPEG	<i>Tourists in the RISL</i>	2010	Ron Leidich		Planetblue@palaunet.com	10
Photograph 46	JPEG	A conservationist in the field	2007	PCS		pcs@palaunet.com	4
Photograph 47	JPEG	Enhanced rock art	2011	Mark Willis		mwillis@blantonassociates.com	11
Photograph 48	JPEG	Rock Islands and Dugong	2010	Mandy Etpison		etpison@palaunet.com	1
Figure 38 - Graph	JPEG	Climate change during the occupation of the Rock Islands.	2010	Geoffrey Clark		geoffrey.clark@anu.edu.au	7
Figure 39 - Graph	JPEG	Size decrease in Scarids (parrotfish) in the Rock Islands.	2010	Masse et al. 2006		wbmasse@lanl.gov	9
Figure 40 - Map	JPEG	Irai stone work village plan.	2010	Clark & Reepmeyer; after Krämer		geoffrey.clark@anu.edu.au	7
Figure 41 - Map	JPEG	Rock Islands stonework village plan.	2010	Clark & Reepmeyer		geoffrey.clark@anu.edu.au	7
Figure 42 - Map	JPEG	Ancient Rock Island titles and islands.	2010	Clark & Reepmeyer		geoffrey.clark@anu.edu.au	7
Photograph 49	JPEG	Manta Rays seen from the air	2010	Mandy Etpison		etpison@palaunet.com	1
Photograph 50	JPEG	Rock Art	2011	Mark Willis		mwillis@blantonassociates.com	11
Figure 43 -Photo	JPEG	Dmasech Island megapode nest in archaeological site.	2010	Geoffrey Clark		geoffrey.clark@anu.edu.au	7
Figure 44 - Photo	JPEG	Little Mariar effect of tree collapse on stone wall feature.	2010	Geoffrey Clark		geoffrey.clark@anu.edu.au	7
Figure 45 - Photo	JPEG	Little Mariar wave impact on prehistoric stone wall.	2010	Geoffrey Clark		geoffrey.clark@anu.edu.au	7
Figure 46 - Photo	JPEG	Ulong Island graffiti on rock art.	2010	Geoffrey Clark		geoffrey.clark@anu.edu.au	7
Figure 47 - Photo	JPEG	Ulong Island rock art covered by algae mat.	2010	Geoffrey Clark		geoffrey.clark@anu.edu.au	7
Photograph 51	JPEG	Ngemelis Island Complex	2010	Patrick L. Colin		crff@palaunet.com	2

Photograph, Image Inventory and other Audiovisual Materials Authorization Table							
Id. No	Format	Caption/Description	Date	Photographer	Copyright owner (if different than photographer)	Contact Details of Copyright Owner	Non-exclusive cession of rights
Photograph 52	JPEG	<i>Ponapea palauensis</i>	2009	Ann Kitalong		kitalong@palaunet.com	YES
Photograph 53	JPEG	Nicobar pigeon Laib	2010	Mandy Etpison		etpison@palaunet.com	1
Photograph 54	JPEG	Fishing Boats	2010	Ron Leidich		Planetblue@palaunet.com	10
Photograph 55	JPEG	Divers	2010	Paul Collins	PCS	paul@absolutediving.co.uk	6
Photograph 56	JPEG	Juvenile fish within seagrass bed	2009	Ann Kitalong		kitalong@palaunet.com	YES
Photograph 57	JPEG	<i>Tridacna gigas</i>		Patrick L. Colin		crrf@palaunet.com	2
Figure 48 - Map	JPEG	Rock Islands/Southern Lagoon management zones.	2010	Clark & Reepmeyer on KSDCLE base map		geoffrey.clark@anu.edu.au	7
Photograph 58	JPEG	German Channel, looking north	2009	Mandy Etpison		etpison@palaunet.com	1
Photograph 59	JPEG	Koror-Peleliu MOU	2011	KSDCLE	KSDCLE	coastalmgnt@kororstate.org	YES
Photograph 60	JPEG	Harvesting Giant Clams	2009	Ann Kitalong/		kitalong@palaunet.com	YES
Photograph 61	JPEG	Unusual perspective of a snorkeler	2010	Ron Leidich		Planetblue@palaunet.com	10
Photograph 62	JPEG	Manta Rays in German Channel	2010	Mandy Etpison		etpison@palaunet.com	1
Photograph 63	JPEG	Branching coral	2010	Ron Leidich		Planetblue@palaunet.com	10
Photograph 64	JPEG	Cardinalfish	2010	Ron Leidich		Planetblue@palaunet.com	10
Figure 49 – Aerial Map	JPEG	Ulong Island cultural site management plan.	2010	Clark & Reepmeyer		geoffrey.clark@anu.edu.au	7
Figure 50 - Photo	JPEG	Ulong Island existing cultural site signage.	2010	Geoffrey Clark		geoffrey.clark@anu.edu.au	7
Figure 51 - Photo	JPEG	Ulong Island example of existing foot path to cultural site.	2010	Geoffrey Clark		geoffrey.clark@anu.edu.au	7
Figure 52 – Aerial Map	JPEG	Dmasech Island cultural site management plan.	2010	Clark & Reepmeyer		geoffrey.clark@anu.edu.au	7
Photograph 65	JPEG	Marine tour guide certification	2007	KSDCLE	KSDCLE	coastalmgnt@kororstate.org	YES
Figure 53 – Graph	Excel graphic	RISL Use Permits versus Palau visitor arrivals	2010	KSDCLE		coastalmgnt@kororstate.org	YES
Photograph 66	JPEG	An aerial view of Ngederrak Reef	2010	Paul Collins		paul@absolutediving.co.uk	6
Photograph 67	JPEG	MPA Habitat map	2010	Paul Collins		paul@absolutediving.co.uk	6
Photograph 68	JPEG	Ngederrak Reef	2010	Paul Collins		paul@absolutediving.co.uk	6
Photograph 69	JPEG	An aerial view of the Rock Islands		Ron Leidich		Planetblue@palaunet.com	10
Photograph 70	JPEG	Jellyfish		Michael N. Dawson		crrf@palaunet.com	2

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7.b Texts relating to protective designation, copies of property management plans or documented management systems and extracts of other plans relevant to the property

As described in previous sections there are many traditional, state and national laws protecting the Rock Islands Southern Lagoon of Koror State as well as dedicated plans focusing on the management of the property. The following documents are provided as appendices to the application.

- **Appendix D.** National and State Regulations applicable to the Rock Islands Southern Lagoon
- **Appendix E.** Rock Islands Southern Lagoon Management Plan 2004-2008 (Three volumes)
- **Appendix F.** Koror-Peleliu German Channel MOU
- **Appendix G.** National Fishing Laws

7.c Form and date of most recent records or inventory of property

Recent records include results from a wide variety of research studies. Original findings are retained by the research agency. Primary agencies with information about the RISL are listed in Section 6c.

7.d Address where inventory, records and archives are held

Koror State Government
P.O. Box 116, Koror, Palau 96940
Tel: (680) 488-8738/4001
Fax: (680) 488-2862
E-mail: coastalmgnt@kororstate.org

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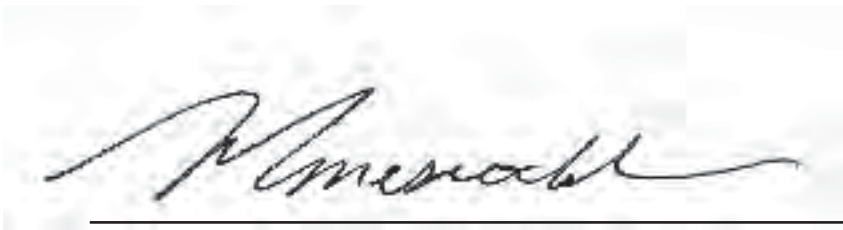
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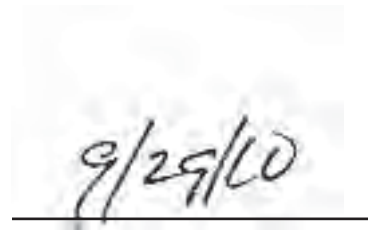
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*The Rock Islands Southern Lagoon
Republic of Palau*



Photo by Michael N. Dawson.



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Rock Islands - Southern Lagoon Area Management Plan 2004 — 2008



Volume I Management Plan

**Koror State Government
Republic of Palau
May 2004**

**Rock Islands Southern Lagoon Area
Management Plan
2004-2008**

**Volume I
Management Plan**

Koror State Government
Republic of Palau

Permission to utilize information

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FOREWORD

The Koror State Department of Conservation and Law Enforcement is responsible for day-to-day management and coordination of activities within the Management Area as well as enforcing all State laws. The department was founded in 1994 and consists of trained, ranked and uniformed rangers that maintain law and order, as well as preserve the unique natural resources of the state. It also has a "Rock Islands Facelift Program", which is responsible for maintaining the tourist activity areas in the Management Area and a Coastal Resources Management Office, whose primary focus has been the development of this comprehensive Management Plan and which will lead its implementation. The purpose of this management plan is to establish a comprehensive, coordinated management program for the Rock Islands-Southern Lagoon Area for the next 5 years.

Our department developed the management plan with assistance from The Nature Conservancy and Palau Conservation Society. The plan was developed over 2 years, using The Nature Conservancy's conservation area planning approach. The plan was reviewed and approved in June 2004, by a Task Force appointed by the Koror State Governor. The Task Force included representatives from the Governor's Office, House of Traditional Leaders, Koror State Legislature, Koror State Public Land Authority, Koror Planning and Zoning Commission, Koror Women's Group and the Ngarametal Association.

The management plan is divided into three volumes. Volume one is a brief, concise document that provides an overview of the management program without the specific details and can be read independently. Volume two is the Action Plan and Monitoring Program, it provides the details required to implement the plan such as timeline and manpower. Volume three is the Background and Analysis it provides the detailed background information and description of the methods used to make the actions.

This 5 year plan is an important first step in an on-going cycle of design, implementation and review, and should be viewed as a "working plan" rather than a static document. The plan will be reviewed, updated and modified yearly as more information becomes available and management strategies are tested for effectiveness.

The Koror State Department of Conservation and Law Enforcement will work closely with key stakeholders, and national and international resource agencies and organizations to implement the plan.

Sincerely,



Adalbert Eledui

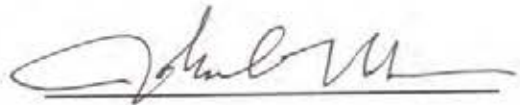
Director, Koror State Dept. of Conservation and Law Enforcement

Approval Page

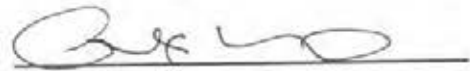
This plan has been reviewed and approved by the
Rock Island Management Area Executive Committee &
Governor John Gibbons

June 2004

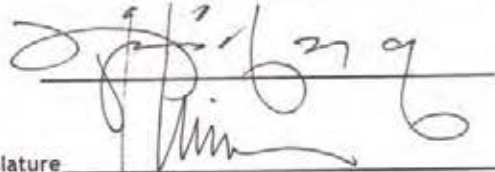
Governor John C. Gibbons



Rechucher Alex Merep, House of Traditional Leaders



Balio Ngiraidong, Special Assistant, House of Traditional Leaders



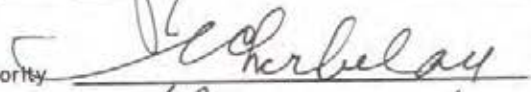
Millan Isack, Chairman Committee on Environment, Koror State Legislature



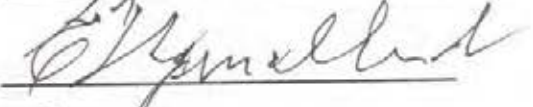
Eyos Rudimch, Chairman Committee on Tourism, Koror State Legislature



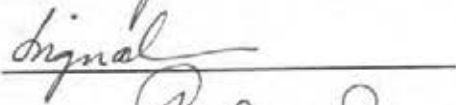
Viviana Ucherbelau, Board Member, Koror State Public Land Authority



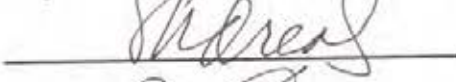
Ermas Ngiraelbaed, Board Member, Koror State Public Land Authority



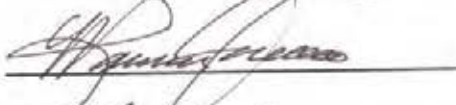
Tutoud Ngiralmu, Vice Chairman, Koror State Planning & Zoning Commission



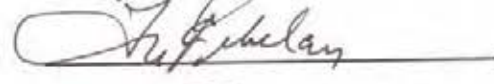
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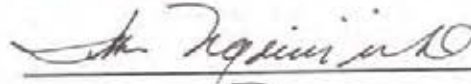
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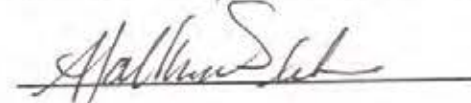
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Takeko Ngirairiki, Koror Traditional Women's Group, Ngaramaiberel



Adalbert Eledui, Director, Conservation & Law Enforcement



Executive Summary

Introduction

The Rock Islands-Southern Lagoon Area of Koror State has unparalleled biological, cultural and economic value to Palau. This Management Area not only provides the foundation for Palau's tourism industry and in turn, the nation's economy, it contributes substantially to the nation's health through commercial and subsistence harvesting of its natural resources. This area is also an essential component of Palau's cultural heritage, host to much of Palau's rich biological diversity, and home to critical habitat for the country's threatened and endangered species. But these resources are under increasing pressure as Palau develops, and must be properly managed to ensure the long-term well being of Palau's biodiversity, culture and economy.

While there have been, and continue to be, a number of conservation initiatives within the Management Area, there is no comprehensive or coordinated management program in place. Recognizing the need for improved management, the Traditional Leaders of Koror State requested the state executive and legislative branches work with them to gain the support of stakeholders in developing an integrated management plan for the conservation of the area's resources. This led the Sixth Koror State Legislature passing a resolution that called for the development of a comprehensive management plan, and the Koror State Governor appointing an executive committee to oversee its development. This 5-year Management Plan is the product of that collaborative effort. The plan covers all of Koror State's land and waters except for the northern Oreor Islands that form the Urban Center of Koror.

Vision and Goals for the Management Area

Our Vision is to maintain the spectacular beauty and the abundant and diverse natural and cultural resources of the Rock Islands Southern Lagoon Management Area so that it can continue to be used and enjoyed by current and future generations of the people of Koror and Palau, and remain a central part of our culture and lifestyle.

The overall goal is to provide for the sustainable use of the natural resources of the Management Area. This will be achieved through the implementation of four broad management objectives focusing on: maintaining biodiversity; preserving traditional, cultural and recreational uses; providing for sustainable subsistence and commercial fishing; and providing for high-quality tourism and recreational activities that do not degrade the environment. All use of the area must be environmentally sustainable, culturally compatible and provide benefits to the people of Koror and Palau.

Management Issues

The Management Plan is divided into 10 priority management issues and actions: harvest of fish, harvest of invertebrates, declining turtle populations, endangered dugongs, forest/terrestrial issues, climate change, tourism and other recreational activities, infrastructure construction and development activities, boating and invasive species.

Harvest of Fish

The Management Area is a major fishing area for people living in Koror with both commercial and non-commercial fishing practiced in the area. As Koror is the main population center, it is probably the most intensively used fishing area in Palau. This high level of fishing is believed to have negatively impacted fish populations in the Management Area. The objective of fishery management actions are to provide for sustainable fishing in the Management Area, with priority to local communities, and with the minimum amount of regulations necessary to maintain fish resources for the future. Management



actions are designed to minimize any further damage to fish habitat, allow existing damaged areas to recover, and manage the fishing pressure to achieve an increase in the health of fisheries within the Management Area.

Harvest of Invertebrates

Invertebrates including crabs, lobsters, clams, shellfish, sea cucumbers and sea urchins have been, and still are, heavily harvested from the Management Area. As noted in the case of fishing, the Management Area is probably the most intensively harvested area in Palau due to its close proximity to the main population center of Koror, which has led to apparent declines in invertebrate populations. Invertebrate harvest will be managed similarly to fisheries, with actions focusing on providing for sustainable harvesting in the Management Area, and with priority to Koror residents. Actions are aimed at minimizing further loss of invertebrate habitat, allowing depleted areas to recover, and managing harvesting pressure to achieve an increase in the health of invertebrate populations within the Management Area.



Declining Turtle Populations

Green turtles and hawksbill turtles are the two main species of sea turtles found in the Management Area: The Management Area provides important habitat for both nesting and resident turtle populations and is one of the most important nesting areas for hawksbill turtles in Palau and regionally. Hawksbill turtles are listed by The World Conservation Union as “Critically Endangered” and Green turtles are listed as “Endangered”. The long-term objective of management activities is to restore the health (sex ratio, size distribution) of hawksbill and green turtle populations in the management area to traditional levels. Management actions are aimed at decreasing turtle and turtle egg harvesting, increasing the number of hawksbill turtles nesting and eggs hatching and the overall number of hawksbill and green turtles within the Management Area.

Endangered Dugongs

The dugong population in Palau is the only population in Micronesia and arguably the most isolated in the world. Palau’s small dugong population is under imminent threat of extinction if the number of dugongs killed in Palau each year does not decrease. The Management Area contains important foraging and resting areas for dugongs, with Malakal harbor being one of the most important dugong habitats in Palau. Dugong management efforts will focus on protecting the dugong population in the Management Area from illegal harvesting and preventing death and injury caused by boat collisions. The long-term objective is to restore the dugong populations in the Management Area to a healthy population size.



Forest/Terrestrial Issues

The Rock Islands support three main types of forest: limestone forest, strand forest and mangrove forest (found mainly around the marine lakes). Each of these are unique forest types, and although they are not well studied, are likely to contain a number of endemic species (found only in Palau or possibly just in the Rock Islands). While the Rock Islands forests are a key part of the unique landscape that attracts tourists to Palau, they are also important habitat for rare birds and animal species. Forests are generally in good condition but are vulnerable to disturbance and invasive plants and animals. Management actions are aimed at maintaining the natural forest cover (including mangroves) on all the Rock Islands and ensuring that healthy populations of the full range of native species are maintained, by preventing the introduction and spread of invasive weeds and animals, allowing limited harvesting of timber for traditional/cultural use, and controlling the level of harvest of fruit bats and native birds.

Climate Change

The devastating effects of climate change were seen in the Management Area in 1998, when significant coral bleaching occurred throughout Palau. Approximately 30-35 % of Palau’s corals were bleached and

killed, during the 1997/98 El Nino-Southern Oscillation event, when local sea surface temperature rose above normal for an extended period of time. Many reefs within the Management Area, including popular snorkeling and dive sites were devastated, some with up to 100% mortality of corals. Management actions focus on enhancing the resilience of coral reefs in the Rock Islands - Southern Lagoon area to climate change by including key resistant and resilient areas throughout Palau in a nationwide network of protected areas designed to maximize survival and recovery following coral bleaching events.

Tourism and Other Recreational Activities

The Management Area is the foundation of Palau's tourism industry and is also an important recreational and relaxation spot for Palau's residents. Increasing numbers of visitors and types of recreational activities have led to safety, congestion and environmental concerns. The objective of management activities are: to provide suitable sites and basic infrastructure to support high quality tourism experiences in the Management Area that have minimal environmental impact and meet visitor expectations; maintain access to the Rock Islands for nature-based recreation by local residents that has minimal environmental impact and supports cultural values; ensure sufficient financial return from tourism activities in the Management Area for sustainable management; and to strengthen the relationship between Koror State Government and Tour-operators.



Infrastructure, Construction and Development activities

The Management Area is zoned a conservation area, thus it is largely undeveloped and has seen very little direct impact from infrastructure, construction and development activities. Most development has occurred on the populated islands of Koror and environmental impacts have largely been restricted to nearby areas, though occasionally fringe sections of the Management Area are affected. But development, of course, could quickly become a top threat to the ecosystems within the Management Area if permitted. The focus of management activities are as follows: to prevent development in the Management Area that would degrade the natural character, environment or tourism values of the area, while allowing necessary infrastructure to support better management of the area to protect those values; minimize degradation and pollution impacts in the Management Area from development around Koror; and to enable aquaculture projects in the Management Area that have negligible environmental impact.

Boating

Boating is an essential part of Palau's way of life and economy and motorboats are used both privately and commercially for transport between islands and to dive and snorkel sites, for fishing, and other recreational activities. In addition large commercial container ships, yachts, and personal watercraft (jet skis) also have restricted passage through the Management Area. The growing number of boats and type of boating activities has raised concerns over the environmental impact these activities are having on the wildlife and the delicate marine systems within the Management Area. Management actions have been developed to ensure safe and enjoyable boating activities that have minimal impact to marine and terrestrial ecosystems in the Management Area, and reduce the loss and degradation of coral reefs in the Management Area due to ship groundings and boat anchoring.



Invasive Species

Introduced and invasive species pose an imminent threat to the biological and economic value of the Management Area's resources. Although relatively few species have become established in the Management Area, invasive species have the potential to alter the natural structure and balance of the Area's marine and land ecosystem if they are not carefully controlled. Management actions are aimed at preventing the establishment of new marine or terrestrial invasive species, and reducing the distribution and area covered by existing invasive species in the Management Area.

Management Actions

The management objectives listed above will be achieved through specific actions that focus on: the review, modification and development of state regulations as well as supporting the strengthening of national regulations, including linking with the national Protected Area Network (PAN); strengthening state law enforcement and supporting national enforcement efforts; increasing education and awareness on specific resource issues and regulations; and research and monitoring that fills information gaps and assesses resources.

Zoning

The zoning plan for the Rock Islands-Southern Lagoon Area builds on the existing state zoning map that designates the Rock Islands as a conservation (CD) zone. The "Rock Islands" refers to all islands, including land and beach areas within the State of Koror except Malakal, Arakebesang, Ngerur Island, Koror Mainland and any other small islets or islands joined to Malakal, Arakebesang or Koror Mainland by causeway or bridge. The zoning plan for the Management Area includes all marine areas in Koror State including the Rock Islands and designates more specific zones within the broader CD zone. It is based on the idea that although various activities and management regimes are appropriate within the Management Area, some of those activities and management regimes are more appropriate in certain areas than they are in other areas. The zoning therefore allocates specified activities, facilities, and management actions to certain defined areas of the Management Area. In the Management Area the activities that require the greatest level of management attention are resource harvesting and tourism. The zoning system will allow harvesting over most of the Management Area but exclude it from specific smaller areas where it would conflict with other management objectives, for example, where there are particularly sensitive conservation values, and where harvesting activities could be expected to significantly reduce the quality of the experience enjoyed by visitors.

Six zones have been created for the Rock Islands Southern Lagoon Area: General Use Zones, Subsistence/recreational Fishery Zones, Preservation Zones, Conservation Zones, Tourism Zones, and Special Management Areas.

Management Plan Implementation and Review

The Koror State Department of Conservation and Law Enforcement will work closely with key stakeholders, and national and international resource agencies and organizations to implement the plan. The plan will be implemented immediately and be in effect for the next 5 years, but it will be reviewed and updated yearly as more information becomes available and the effectiveness of management actions are assessed.

In order to successfully implement the actions presented in the Management Plan, it will be necessary to raise resources and staff numbers within the Department of Conservation and Law Enforcement to the levels required to effectively implement conservation and enforcement programs in the Management Area, as well as increase the efficiency of administration and enforcement procedures within the Department.

Another factor critical to the successful implementation of the plan will be the enactment of new legislation to empower resource managers to take the management actions described in the Management Plan. An accompaniment to the Management Plan is a Comprehensive Management Act for the Rock Islands-Southern Lagoon Area. This act is intended to replace the existing Year 2000 Rock Islands Management and Conservation Act. In addition separate regulations, which can be updated as necessary, will be developed to support the Act.

It is important to keep in mind as we move forward that the Management Plan is the critical first step in an on-going cycle of design, implementation and review - also known as "adaptive" management - and should be viewed as a "working plan," rather than a final, static document. .

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List of Acronyms

AG	Attorney General
CD Zone	Conservation Zone
AIMS	Australian Institute of Marine Science
BMR	Bureau of Marine Resources
BTA	Belau Tourism Association
C3	Community Centered Conservation
CITES	Convention on the International Trade of Endangered Species
CORAL	Coral Reef Alliance
COTS	Crown Of Thorns Starfish
CRRF	Coral Reef Research Foundation
EQPB	Environment Quality Protection Board
GBRMPA	Great Barrier Reef Marine Park Authority
GCRMN	Global Coral Reef Monitoring Network
GEF	Global Environment Facility
ICRAN	International Coral Reef Action Network
HOTL	House of Traditional Leaders
IUCN	International Union of Conservation
Management Area	Rock Islands - Southern Lagoon Management Area
KS	Koror State
KSPLA	Koror State Public Land Authority
KSPZC	Koror State Planning and Zoning Commission
MEERT	Marine Environment Enforcement Response Team
MOU	Memorandum of Understanding
NOAA	National Oceanic and Atmospheric Administration
NFWF	U.S. National Fish and Wildlife Foundation
OERC	Office of Environment Response and Coordination
PCC	Palau Community College
PCS	Palau Conservation Society
PICRC	Palau International Coral Reef Center
PVA	Palau Visitors Authority
SPREP	South Pacific Regional Environment Program
TET	Tilapia Eradication Taskforce
TNC	The Nature Conservancy

Definitions

Commercial harvest means to collect plants or animals for the main reason of selling them.

Fish as a noun refers to all finfish that live in the sea or marine lakes and does not include invertebrates or mammals.

Fishing means to take, catch, or harvest fish, or attempt to do so.

Invertebrates means any organism that does not have a back bone (vertebrae).

Recreational harvest means to collect plants or animals for enjoyment and to provide food, but not for sale.

Subsistence harvest means to collect plants or animals solely to provide food for family and friends but not for sale.

Chapter 1: Introduction

1.1 Background to the Management Plan

The Rock Islands-Southern Lagoon Area of Koror State is internationally known for its stunning beauty above and below the water. As a world-class dive destination, the area provides the foundation for Palau's tourism industry and in turn, the nation's economy. Commercial and subsistence harvesting of the area's natural resources also contributes substantially to the nation's financial health. But the value of the Management Area to Palau goes far beyond economics. The area is an integral part of Palau's cultural heritage. It contributes significantly to Palau's biodiversity and provides important habitat for the country's threatened and endangered species. That's why properly managing and maintaining the ecological integrity of the area is critical for the well being of Palau's economy, culture and diversity.

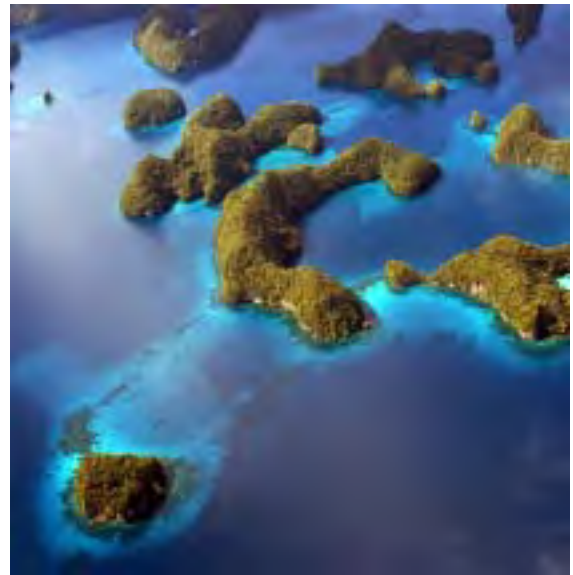


Figure 1. Aerial view of the Rock Islands. Photo courtesy of Scott Radway.

The Traditional Leaders of Koror and the Koror State Government own and have jurisdiction over the Rock Island-Southern Lagoon Area (also referred to in this plan as the Management Area). The Traditional Leaders have always taken responsibility for the Management Area, but they have recognized in recent years that the increasingly intensive and varied use of the area has resulted in greater and more complex challenges for management. As a result the Traditional Leaders requested the Koror State executive and legislative branches to work with them to gain the support and cooperation of interested parties and improve management of the area.

The Sixth Koror State Legislature, recognizing the local, national and international significance of the Management Area, passed a resolution calling for an integrated management plan for the conservation of its resources. The governor then appointed an executive committee to oversee the development of a comprehensive management plan.

And while there have been, and continue to be, a number of management and conservation activities and initiatives under way (e.g., traditional controls, Koror State Government programs, National Government activities, and non-governmental initiatives), until now there has been no comprehensive and coordinated program in place. This plan is the first time such a comprehensive and coordinated program has been developed.

1.2 Purpose and Geographic Scope of the Management Plan

The purpose of this management plan is to establish a comprehensive, coordinated management program for the Rock Islands-Southern Lagoon Area for the next 5 years. This plan is an important first step in an on-going cycle of design, implementation and review, and should be viewed as a "working plan" rather than a static document. The plan will be reviewed, updated and modified yearly as more information becomes available and management strategies are tested for effectiveness.

The Management Area covers all of Koror State's waters, from its boundaries with Airai and Aimeliik States in the north to Bailechesengel Point in the southwest and the boundary of Peleliu State in the south, and includes all waters from the traditional baselines to 12 nautical miles seaward, as described in the State Constitution (Figure 2). The area within the barrier reef covers an area of approximately 621 km² and includes all land areas within these waters except for the northern Oreor Islands of Oreor-

Ngerekebesang-Ngermelachel that form the main Koror town area. The islands of Malakal, Arakebesang, Ngerur Island, Koror mainland and any other small islets or islands joined by causeway or bridge are also considered to be part of the town area and are outside the Management Area.

1.3 Legislative Basis for the Plan

Management of the Rock Islands Area is currently governed by the Year 2000 Rock Islands Management and Conservation Act (Koror State Public Law K6-113-00), and a number of other State rules and regulations (see Table 1). Following approval of this plan, a Comprehensive Management Act for the Rock Islands-Southern Lagoon Area will be developed. This will be accompanied by regulations, which can be updated as necessary, to enable implementation of regulatory aspects of this plan not already governed.

The new Act will replace Koror State Public Law No. K6-113-00.

1.4 The Approach to Plan Preparation

The Koror State Department of Conservation and Law Enforcement developed the management plan with assistance from The Nature Conservancy and Palau Conservation Society. The plan was developed over 2 years, using The Nature Conservancy's conservation area planning approach and tool and extensive consultations with key stakeholders who use the Management Area and its natural resources. The plan was reviewed and approved by a Task Force appointed by the Koror State Governor. The Task Force included representatives from the Governor's Office, House of Traditional Leaders, Koror State Legislature, Koror State Public Land Authority, Koror Planning and Zoning Commission, Koror Women's Group and the Ngarametal Association.

1.5 Organization and Format

The Rock Islands-Southern Lagoon Management Plan has been organized into three separate, easy-to-read volumes rather than a bulky "One Volume" format often used in management documents. The key management issues and actions are presented in Volume 1 to give readers a comprehensive review of the management plan without having to labor through extensive background information and specifics that may not be relevant to them.

Volume I: "Management Plan" is a brief, concise document that provides an overview of the management program without expanding on the specific details needed to implement it. It can be read independently of the other volumes and will be of value to all resource users and decision makers.



Figure 2. The Management Area includes all of Koror State's waters and land within these waters (excluding Koror).

Volume II: “Action Plan and Monitoring Program” provides the detailed information required by Koror State to implement the plan and is intended for use by resource managers in developing and implementing their annual work plans.

Volume III: “Background and Analysis” includes detailed background information and description of the methods and analysis used to formulate the management actions.

Volume I is organized into six chapters:

- Chapter 1 Presents the *purpose of the management plan* and the approach used in preparing the plan.
- Chapter 2 Describes the *biophysical characteristics* of the Management Area and the *social and economic characteristics* of communities and stakeholders using the area.
- Chapter 3 Details the *management goals and objectives* for the area.
- Chapter 4 Describes the *management issues and actions* for the area. It provides guidance for decision-makers during the 5-year period of the plan. The detailed action plan is described in Volume 3.
- Chapter 5 Defines the *zoning* necessary to address the issues and values identified in the earlier chapters.
- Chapter 6 Describes the *implementation* of the management plan.

1.6 Implementation

The Koror State Department of Conservation and Law Enforcement will work closely with key stakeholders, and national and international resource agencies and organizations to implement the plan. The plan will be implemented immediately and be in effect for the next 5 years, but it will be reviewed and updated yearly as more information becomes available and the effectiveness of management actions are assessed.

This plan is thus intended to provide a framework for collective decision-making by Koror State and stakeholders over the coming years. Acting within this framework and upon a continually growing base of shared knowledge and skills, Koror State and stakeholders can continue to improve and refine their management responses over time.



Figure 3. The Director explains management issues to the RIMA executive committee.

Chapter 2: Description of the Rock Islands-Southern Lagoon Area

2.1 Biophysical Description

2.1.1 Geology

The Rock Islands-Southern Lagoon Area is endowed with a unique and stunning landscape of limestone islands, marine lakes, and coral reefs. The Management Area is enclosed by 86 km of barrier reef on the east (ocean side) and 112 km on west (lagoon side) with substantial openings to the Pacific Ocean on the northeast side. Within the barrier reef is a large lagoon area with extensive fringing and patch reef systems with about 500 patch reefs and 150 fringing reefs (Maragos *et al.* 1994). The lagoon extends well to the north of the Management Area on the west side of Koror and Babeldaob and varies in depth from 10-40 meters. The area contains approximately 424 limestone islands formed when tectonic activity thrust ancient coral reef and seabed above sea level: 397 are steep "Rock Islands," and 27 are low islands on the barrier reef.



Figure 4. A typical mushroom shaped rock island.

There are approximately 50 marine lakes contained within the Rock Islands in the Management Area, connected to the lagoon via fissures and tunnels in the limestone rock. These unique lakes were formed approximately 10,000 years ago when the sea level rose, filling jungle covered depressions within the porous limestone.

2.1.2 Biodiversity Values

The islands and oceans within the Management Area provide exceptional habitat and species for a large number of marine and terrestrial plant and animal species, including several threatened and endangered species and some species unique to Palau and /or Micronesia. Palau has the most diverse coral fauna of Micronesia and highest density of tropical marine habitats in a comparable geographic area found anywhere in the world (Golbuu, 2000). Located in the center of the Indo-Pacific, Palau is one of the most biologically diverse marine areas in the world, with hard coral diversity comparable to the highest coral diversity areas recorded in Indonesia, Philippines and Australia (Maragos 1994).

More than 400 species of hard corals (Maragos, 1994), 115 species of soft corals (Starmer, 2002), and 1,350 species of marine fish (Meyers, 1999) have been recorded in Palau, and many of these species occur in the Management Area. A total of 181 species of hard corals, 343 species of reef fish, and 47 species of other macro-invertebrates were observed in the southern lagoon during a rapid ecological assessment conducted in 1992 (Maragos, 1994). The open ocean that surrounds most of the Management Area boasts a rich pelagic fishery and the deep reef habitat supports precious corals (e.g. black corals) and a chambered nautilus, which is endemic to Palau.

Mangroves are present in small patches in some protected coves and marine lakes. Important populations of baitfish, including the gold-spotted herring, are associated with these mangrove stands (e.g. at Ngkisaol). Seagrass beds are found in several areas, particularly near Ngemelis, and provide feeding grounds for the endangered green sea turtle (*Melob*) and the dugong (*Mesekiu*). Palau has the only hawksbill sea turtle (or *ngasech*) nesting sites in Micronesia, and the Rock Islands provide Palau's most important nesting sites. The endangered estuarine crocodile has been reported in several of the Rock Islands' marine lakes, although the lakes are not believed to provide breeding habitat (Messel and King, 1991).

A variety of the Marianas fruit bat is endemic to Palau and is common in the Rock Islands. The island of Ngeruktabel has a large roosting area, with as many as 500 bats. Bats are found in substantial numbers on other islands, as well, including the protected Ngerukuid islands. The endangered Micronesian megapode is found throughout the Rock Islands and many other birds are also sighted and some appear to be limited to the Rock Islands. Two, the Nicobar pigeon and the blue-faced parrot finch, have been recommended for listing as endangered, and were found to have their highest population densities in the Rock Islands (the latter was found only in the Rock Islands). The Palau greater white-eye appears to be restricted to Ngeruktabel and the Palau ground dove and several seabirds, including the Audubon shearwater, the bridled tern, and the black-naped tern also appear to be largely restricted to the Rock Islands.



Figure 5. A typical outer reef scene within the Management Area. Photo courtesy of PCS.

Although covered with only thin layers of soil, the Rock Islands are densely vegetated with a great variety of vascular plants. Manner and Raulerson (1989) reported 123 species of plants in the Ngerukuid islands, most of them indigenous or endemic. The endemic palm is considered to be endangered and has disappeared from many of the Rock Islands, perhaps because it is a preferred food of the introduced sulfur-crested cockatoo.

The marine lakes of the Rock Islands are unique marine ecosystems supporting unique assemblages of habitats and communities of organisms found nowhere else in the world. Their value as “natural marine laboratories” for basic ecological research is world-renowned.

2.2 Social and Economic Context

2.2.1 Economic/Recreational Values

The Management Area is a major source of revenue for Palau. It is the focus of Palau’s tourism industry and supports valuable commercial, recreational and subsistence fisheries.

Palau consistently rates as one of the world’s best diving locations and was declared one of the seven wonders of the underwater world by CEDAM (Conservation, Education, Diving, Awareness, and Marine Research) International in 1989. Most of Palau’s famed dive sites are located within the Management Area and are the focus of Palau’s diving industry. Tourism is the largest income source for the nation’s private sector and generated roughly \$66.1 million from the estimated 58,560 visitors in 2002 (Osman, 2003). The majority of these were divers (70%), and an additional 13.6% undertook other leisure activities in the Rock Islands (Osman, 2003). The State and National Government generate tourism related revenue through business license fees, taxes, etc., and Koror State collected approximately \$505,000 from Rock Island permit fees alone in 2002.

The area is also an important recreational and relaxation area for Palau’s residents- being on the doorstep of Palau’s most populated island Koror. Visitors and locals together enjoy the area’s natural beauty through a variety of activities including: SCUBA diving, snorkeling, fishing, kayaking, sea walking (walking on the sea floor with a modified scuba helmet), parasailing, banana boating (an inflatable “banana” shaped rubber float pulled behind a motorboat), sailing, jet skiing, water-skiing, camping, picnicking and other beach activities. The area also has a number of cultural and historical attractions, including remains of ancient villages, rock art, early European contact and WW II wrecks.



Figure 6. Locals relaxing on Ngeremdiu beach.

Commercial, recreational and subsistence fisheries are valuable to the local economy. Although it is difficult to estimate the economic value of the management areas fisheries due to lack of readily available catch and financial data, it is known that the areas fisheries contribute significantly to national fisheries production, with Koror's fisheries production the highest in Palau at 513,030 kg from 1992-1998 (Golbuu, 2002). The area is also heavily utilized by recreational and subsistence fishermen and women due to its close proximity to Palau's main population center of Koror. The value of subsistence fisheries in Koror State and Palau is currently being assessed by PICRC and PCS.

2.2.2 Cultural/Historical Values

The Rock Islands and the surrounding marine areas that make up the Management Area are an integral part of Palau's cultural identity, both in the present day and historically. Many families continue to visit the Management Area to fish, dig up clams, relax and barbecue on the white sandy beaches that fringe many of the islands, just as their parents and grandparents did. The area also provides a source of local fibers (coconut fronds and pandanus leaves) for traditional handicraft as well as an inspiration for local artists who interpret the stunning scenery and wildlife through traditional and modern art forms.

The Rock Islands in the Management Area also hold clues to Palau's pre-history and migration history though prehistoric rock paintings, archaeological remains of abandoned settlements and a rich oral history. The people of Koror and other areas of Palau trace their ancestry to the Rock Islands and oral histories of these areas recount the movement of peoples from and through the Rock Islands to Koror and throughout Palau (Nero, 1997). The Rock Islands or "Ocheall" meaning "Rocky Place" are believed to have been settled from approximately 650 A.D. at Uchularois, Ngemelis, to some time in the mid 1600's or possibly as late as the 1700's at Ngerenghcol, Ulebsechel (Nero, 1997). The Rock Islands were also visited by people from the neighboring island of Yap, who traveled roughly 250 miles to carve large stone money disks from aragonite, a type of limestone common in the Rock Islands. The remains of stone money quarries, and stone money, dating back to around AD 1500 can be found in the Management Area. Prehistoric rock paintings are located at 6 locations (5 within the management area): Metuker ra Bisech, Aluptaciel, Ngeruktabel, Ulong and Eastern Koror (Ngermid) (Schmidt, 1974). These paintings are believed to have been created by people not from Palau, but who eventually became part of the local population.

The Management Area also contains remnants of recent historical events. One of the first recorded encounters with Europeans took place at Ulong Island in 1783 when Captain Henry Wilson and the crew of East Indian ship "the Antelope" took refuge on the Island after being shipwrecked on a nearby reef. (Osborne, 1966). Jungle-covered ruins of a military base built during the German occupation of Palau, can be found on Ngeruktabel Island. World War II artifacts are also spread throughout the Management Area. The remains of Japanese lookouts or "pill boxes" can still be found within the rugged terrain of the Rock Islands, and sunken Japanese and American ships and planes destroyed during the war still remain in its waters.



Figure 7. Remains of an ancient stone wall at Mariar.

2.2.3 Educational Values

The unique landscape, rich biological diversity and history of the management area provide an invaluable educational resource for Palauans and the world. The Management Area is an unparalleled natural classroom where students can learn first hand about natural environmental processes, geology, biology as well as Palau's history, origins and culture. It has been the focus of several graduate studies in different disciplines including natural sciences, archeology and anthropology, and provides endless research opportunities.



Figure 8. Palauan students learning how to monitor seagrass beds. Photo courtesy of PICRC.

2.3 Management Framework and History

The Rock Islands - Southern Lagoon Area is owned and regulated by the traditional leadership of Koror and the Koror State Government, who have appointed the Koror State Public Lands Authority and the Koror State Planning and Zoning Commission to oversee all land and designate land use and zoning, respectively. The State's Department of Conservation and Law Enforcement is responsible for running the Management Area and enforcing State environmental laws. The Koror State Rangers was first established in 1989 to enforce State curfew laws, and later became the Department of Conservation and Law Enforcement in 1994. In the 10 years that the department has been established, it has, and continues to work closely with a range of locally based agencies and organizations on management and research activities within the Management Area. This has resulted in the development of State regulations on resource use and activities and designation of protected areas within the Management Area.

National domestic fishing laws also apply to the Management Area and are enforced by national enforcement officers at the Division of Fish and Wildlife. The State cannot currently enforce national laws but is working to remedy this. Additional national regulations that control access to specific areas in the Management Area have been reinforced by State Law, and are thus enforced by the Rangers. This includes Palau's first protected area, the Ngerukuid Islands Wildlife Preserve, which was established by the Trust Territory Government in 1956 and the State in 1999; and restrictions on fishing in Ngerumekaol Spawning Area that were established by National Law in 1976 and strengthened by State Law in 1999.

Long before modern conservation laws were developed, Palau's resources were managed by Traditional controls, such as bul (harvest restriction) and marine tenure. Although traditional marine tenure no longer exists within the Management Area, traditional controls have been maintained and are the basis of many modern day conservation initiatives. A Traditional Decree declared by the Ngarameketti Chiefs Council of Koror in 1973, still restricts harvesting of marine and terrestrial resources in the Rock Islands and the surrounding waters in the Management Area.

Modern day conservation initiatives are supported by a range of State laws that regulate: general resource use, recreational activities and designate protected areas within the Management Area (see Table 1). The Year 2000 Rock Islands Management and Conservation Act, which regulates recreational activities, provides much of the basis for current management activities in the Management Area. This Act will be replaced by passage of the Comprehensive Management Act that will accompany this Management Plan.

Table 1. Summary of Koror State Acts & Regulations relevant to the Management Area			
Regulation	Purpose	Reference	Effective
General Resource Use			
Permit for Shell Collection	Regulates collection of shells, except for scientific purposes or for food.	MO 46-69	1969
Photo Permit (commercial use)	Regulates commercial photography (still & movies) by non-residents of the State.	MO 50-69	1969
Harvesting restrictions in the Rock Islands, Decree by Ngarameketii, Chief Council of Koror	Prohibits harvest of any marine or terrestrial life by non-residents of the State, & the taking of domestic animals to the Rock Islands.		1973
Fishing License (commercial)	Regulates commercial harvest of marine resources, & prohibits use of damaging fishing techniques.	K4-68-95	1995
Harvesting & cutting of vegetation in mangroves.	Prohibits harvest of vegetation in mangrove & wetlands below high tide.	K6-110-2000	2000
Sardine harvesting restrictions	Prohibits sale of sardines (mekebud) & restricts fishing or capture of sardines (mekebud, mearu, & teber) for 4 days before & during full moon.	K6-95-99	1999
Rock Islands Management & Conservation Act	Designates tourist activity areas, & requires that all tourists hold a valid Rock Island User Permit.	K6-113-2000	2000
Economic & non-economic values of coral reef ecosystems	Recognizes the economic & non-economic values present in coral reef ecosystems in Koror State waters, & authorizes the Governor to put in effect rules & regulations to enforce this Act.	K6-121-2001	2001
Rock Islands Management & Conservation Act Amendment	Exempts children 5 years old or less, & visitors to Dolphin Pacific (only) from requiring a Rock Island User Permit.	K6-126-2001	2001
State Parks-Koror Side Japan Friendship Bridge & Long Island	Designates Koror State Parks in these two areas.	K7-132-2002	2002
Fishing License Amendment (Non-Commercial use)	Prohibits non-Palauan citizens from fishing from land on Koror Island. Fishing license permits fishing from a boat or registered watercraft only.	K7-138-2003	2003
Land Crab Act (rekung el daob, rekug el beab, kesuar)	Prohibits the taking, possession, & sale of live or dead land crabs during certain times, & undersized or berried crabs at any time.	K7-140-2003	2003
Boating			
Boat Registration Act	Requires motorboat owners that reside in Koror to register boats to operate within State waters.	K6-99-99	1999
Cruising Yacht Permit (non-commercial)	Requires yacht owners to have permits when anchoring, mooring or docking within Koror State waters, except Malakal Port.	K6-107-2000	2000
Live aboard Vessels	Limits the number of live-aboard vessels operating in KS, bans operation of new vessels, & established permit fees.	K6-124-2001	2001
Prohibit motorboat operation at Kerker ra Kosiil	Prohibits motorboat operation.	K7-130-2002	2002
Jetski & similar motorized personal watercraft	Establishes safety & operational regulations for personal watercraft & designates 4 water sport zones.	K7-139-2003	2003
Protected Areas			
Ngemelis Island Complex- no fishing within one mile	Prohibits fishing within 1 mile of the island complex.	K6-68-95	1995
Ngkisaol Sardines Sanctuary (mekebud, merau, & teber)	Prohibits fishing or taking of sardines within 100 yards.	K6-95-99	1999
Ngemelis Island Complex-no motorboat operation	No operation of motorboat between island complex.	K6-97-99	1999
Ngerukuid Islands Wildlife Preserve	Prohibits transport of firearms or other weapons capable of killing or capturing birds, animals or marine life, bans transport of domestic animals, use of fire or cutting, destroying or removing plants.	K6-101-99	1999
Ngerumekaol Spawning Area	Prohibits fishing, killing, trapping or possession of fish at any time.	K6-101-99	1999
Soft coral arch, cemetery reef, & all marine lakes	Prohibits fishing, hunting or taking of any marine flora & fauna.	K6-95-99	1999
Ngederrak Reef Area moratorium	Prohibits fishing, hunting or taking of any marine flora & fauna.	K6-119-2001	2001
Extension of moratorium - Ngederrak Reef	Extends moratorium until Jan 9, 2005.	K7-133-2002	2002
Permanent Conservation Moratorium - Ngederrak Reef	Repeals K7-133-2002, to establish a permanent conservation moratorium of Ngederrak Reef	K7-156-2005	2005
Ngerkebesang Conservation Zone	Prohibits fishing, hunting, taking or disturbance of any marine flora & fauna.	K7-136-2002	2002

Chapter 3: Management Goals and Objectives

3.1 Management Vision

To maintain the spectacular beauty and the abundant and diverse natural and cultural resources of the Rock Islands Southern Lagoon Area so that it can continue to be used and enjoyed by current and future generations of the people of Koror and Palau, and remain a central part of our culture and lifestyle.



3.2 Management Goal

To provide for the sustainable use and conservation of the natural resources of the Management Area.

3.3 Management Objectives

3.3.1 Biological diversity

Maintain the full range and richness of **biological diversity**, species habitats, ecological processes and high environmental quality of the Management Area.



3.3.2 Traditional Values

Preserve the **traditional, cultural and recreational values** of the Management Area for the people of Koror and Palau.

3.3.3 Subsistence and Commercial Fishing

Provide for **subsistence and commercial fishing and other extractive activities** in the Management Area that are environmentally and economically sustainable and culturally compatible, and provide continued benefits to the people of Koror and Palau.



3.3.4 Tourism and Recreational Activities

Provide for high quality **tourism and recreational activities** in the Management Area that are environmentally and economically sustainable, culturally compatible and provide benefits to the people of Koror and Palau.



Chapter 4. Management Issues and Actions

4.1 Harvest of Fish

DESCRIPTION OF MANAGEMENT ISSUE

The Management Area is a major fishing area for people living in Koror. As Koror is the main population center, it is probably the most intensively used fishing area in Palau.

Both commercial and non-commercial fishing is practiced in the area. There is a lot of overlap between these, with many people selling a portion of their catch while keeping some for their own use. Some fishermen and women, however, focus primarily on commercial fishing, mostly for the local food fish market, with some commercial export, primarily to Guam and Saipan. There is also “non-commercial” export of reef fish to Palauan families living abroad in places such as Guam and Hawaii. Unicorn fish, snapper, emperors, rabbit fish, parrotfish, giant parrotfish and groupers were the most commonly landed commercial reef fish in Palau from 1976 - 1990 (Kitalong & Dalzell, 1994).

Much of the fishing carried out is partly recreational in nature. Many locals fish during weekends or evenings for fun and relaxation and to take fish home for family consumption, but sell excess fish to the markets. Recreational fishing is also practiced by a relatively small percentage of tourists and by some expatriates working in Palau. Foreign workers also fish for “subsistence” purposes to provide food for themselves and their families and friends. In addition to fishing for food, there is also one operation that targets aquarium fish species for the overseas market.

The high level of fishing in the Management Area is believed to have had several negative impacts on fish populations. These include:

- A decrease in the number and size of reef dwelling fish;
- A reduction in the populations of key large reef food fish species;
- A decline in fish species observed in seagrass systems; and
- A change in size distributions of large reef food fish species populations through selective over-exploitation of certain size classes.

Although there is little scientific data to validate these perceived impacts, repeated consultations with fishers (see PCS 2004) and community members support these claims.

Some fishing practices also have secondary effects that exacerbate the direct pressure on fish populations. For example, damage to reefs caused by anchoring on the reef and destructive fish harvesting techniques (use of dynamite and bleach, physical damage of coral) reduce the functionality of reefs as habitat. Fish habitats such as seagrass beds can be damaged by practices such as use of net-kesokes.

Other practices such as targeting fish aggregation sites disturb the behavioral patterns and ecology (life cycle) of large reef food fish, thus reduce their ability to breed and maintain healthy populations. Together, these direct and indirect impacts are a major threat to the long-term health of the fisheries of the Rock Islands Management Area. The actions on the following pages aim to address these issues.

“Fish” refers to all finfish that live in the sea and does not include invertebrates or mammals. “Fishing” refers to the harvest of fish.



Figure 9. Fishing in the Rock Islands Management Area provides major economic and cultural benefits to the people of Koror and Palau. Photo courtesy of PCS.

MANAGEMENT ACTIONS - HARVEST OF FISH

Objectives

- ❖ Provide for sustainable fishing in the management area, with priority to local communities, and with the minimum amount of regulations necessary to maintain fish resources for the future.
- ❖ Minimize any further damage to fish habitat, allow existing damaged areas to recover, and manage the fishing pressure to achieve an increase in the health of fisheries within the Rock Islands Management Area during the next 5 years.

Review, modification and development of regulations

- Maintain existing fishing regulations, conservation and no-take areas.
- Maintain the ban on commercial fishing within the reef by foreign-owned fishing businesses and joint-commercial fishing ventures with foreign fishermen.
- Lobby the national government to extend the closed season for grouper harvest by one month to August. (New closed season would be from April 1 to August 31).
- Give Ngederrak reef long-term protection, by designating a preservation zone, with no access to this area except for scientific research, monitoring and law enforcement.
- Establish subsistence/recreational fishery zones for protection of critical fish habitat.
- Establish a permit system to restrict taking of live fish as breeding stock for aquaculture enterprises and for export.
- Support national government efforts to review and update existing national harvesting laws for inshore fisheries.
- Investigate spawning aggregations (other than Ngerumekaol) and establish fishing restrictions or other control measures if necessary to ensure their long-term survival.

Enforcement of regulations

- Maintain regular 24-hour surveillance of fishing areas to check for illegal fishing activities and methods, with daily variation of patrol routes.
- Undertake routine random checks of boats to ensure compliance with regulations.
- Undertake weekly random patrols of fishing markets to ensure compliance with fishing regulations and business licenses.
- Enforce the existing fishing license system.
- Assist enforcement of national regulations that require foreign fishing vessels to stow their fishing gear within 12 miles of the barrier reef

⇒ Corresponding notes

See Table 2 & 3.

See Table 2. There is also a national ban in territorial waters(12 nautical miles of traditional baseline).

Recent research has indicated that grouper spawning continues through August.

Ngederrak reef area is critical habitat for dugong, and an important nursery area for fish and invertebrates. See zone 5.2.5.

See Chapter 5 for description of zones and conditions.

Includes size and bag limits, and seasonal restrictions. See Table 3 for national laws.

Ngerumekaol (Ulong Channel) is already protected under existing regulations. Adequate protection of spawning aggregation sites is necessary to sustain fish populations and future fishing resources.

Patrols are undertaken by Koror State Rangers.

Work with Office of the Attorney General to establish the state's authority to enforce national laws.

- Increase patrols of Ngerumekaol (Ulong Channel) and other protected spawning aggregation sites during the fish spawning period (presently April 1 through July 31).
- Maintain regular daily patrols of protected areas to check for illegal fishing activities.

Education and awareness

- Publicize harvesting regulations and conservation areas through brochures, posters, maps, newspaper, radio, television, and presentations and signs on docks or other public places.
- Develop and implement targeted awareness and education programs for resource users (including tourists) to increase their knowledge and understanding of the importance of fish resources and the reasons for regulations and restrictions.
- Publicize through newspapers, magazines and radio the results of fish monitoring programs and significant changes in fish-stocks.

Research and monitoring

- Establish a permanent monitoring program at Ngerumekaol spawning aggregation site to monitor the number of groupers aggregating and map the size of the aggregation (at least three key species monthly during the spawning season).
- Identify and assess the significance of spawning aggregation sites other than Ngerumekaol.
- Continue annual monitoring of fish populations (other than grouper) at Ngerumekaol.
- Continue annual monitoring of fish and invertebrates at Ngederrak reef and control sites (non-protected reefs outside Ngederrak).
- Conduct annual fish monitoring of permanent monitoring sites at German Channel, Ngemelis and Ngerechong.
- Provide access to sites and encourage PICRC and Bureau of Marine Resources to undertake research into sustainable harvest levels, and provide logistical support or funding where possible.
- Support research into overall recreational, subsistence and commercial fishing limits for species of concern and evaluate feasibility and effectiveness of possible strategies for implementing these limits.
- Review fish monitoring activities and incorporate findings into an overall Rock Islands monitoring plan.

The critical period for protection of spawning aggregation sites is during the week before each new moon.

The aim is to make all fishers fully aware of fishing regulations, including illegal fishing methods.

Subjects will include the life cycle of valuable/at risk fish species (e.g. groupers), why they need protection, need for size restrictions, and benefits of marine protected areas / conservation areas.

The public needs to be informed of the impacts of resource use and of management actions such as protected areas so they can see the benefits of improved management.

Based on techniques developed by Tom Graham, TNC and CRRF (Pat Colin). KS may conduct monitoring research, work with other organizations such as PICRC or the Bureau of Marine Resources, or contract work out to other agencies.

Possible restrictions include bag limits, overall limits, size limits.

See Volume II for monitoring plan.

Table 2. Existing State Fishing Regulations

- No fishing, hunting or disturbance or possession or transport of any firearms of any description, or other weapons, nets, traps, snares or objects or materials capable of killing, or otherwise taking birds, animals, or marine life in Ngerukuid Islands Wildlife preserve.
- No fishing all year round, no hunting, disturbance or possession of any fish in Ngerumekaol Spawning Area (Ulong Channel).
- No fishing within one mile of the Ngemelis Island Complex.
- No fishing, hunting or disturbance of sardines within 100 yards of Ngkisaol (Inlet) Sardines sanctuary.
- No selling of sardines (*mekebud, merau, teber*) at any time in Koror State.
- No fishing of sardines (*mekebud, merau, teber*) 4 days before and during the full moon.
- No fishing, hunting, taking or disturbance of any marine flora and fauna at Soft Coral Arch, Cemetery Reef, and any marine lake, and Ngerkebesang Conservation Zone.
- No hunting or fishing, no taking, removal, or disturbance of any marine flora and fauna and no entry of motorized watercraft at Ngederrak Reef Area (a permanent conservation moratorium).
- All non-Palauan citizens and tourists must attain a fishing license to partake in recreational fishing activities. Non-Palauan citizens are prohibited from fishing on any kind of land or improvements to land on the Island of Koror, and may only engage in fishing activities from a boat or registered watercraft.
- Licenses are required for all commercial fishing in Koror State Waters.
- In addition to no-take areas, the following fishing methods are prohibited:
 - Spearfishing using a spear or projectile powered by gas or any explosive mechanism;
 - Fishing with the assistance of any explosive substance or any harmful substance or poison;
 - Fishing using any net with mesh smaller than 3 inches on any side of the hole;
 - Commercial fishing within the reef by foreign licensee or any company with foreign partnership or joint venture;
 - Drag and drift net fishing both inside and outside the reef except for the purpose of bait collection;
 - Fishing using any net that is moved by any vessel;
 - Fishing using any form of mechanically compressed air or other breathing apparatus;
 - Receiving, buying, transporting, storing, using, eating, or selling any fish obtained in violation of this law;
 - Fishing for trochus at any time except during the trochus season as mandated by the ROP, unless further restricted by Koror State.

Table 3: Fish Species Regulated by Law.

Palauan name	FAO common name	Scientific name	Minimum Size	Harvesting Season	Other restrictions
Meteungerel' temekai Ksau' temekai Tiau Mokas Katuu'tiau Tiau	Brown marbled grouper Camouflage grouper Squaretail coral grouper Blacksaddled coral grouper Blacksaddled coral grouper Leopard coral grouper	<i>Epinephelus fuscoguttatus</i> <i>Epinephelus polyphemadion</i> <i>Plectropomus areolatus</i> <i>Plectropomus laevis</i> <i>Plectropomus laevis</i> <i>Plectropomus leopardus</i>	No	Closed April 1 thru July 31	Illegal to buy or sell during closed season.
Meyas	Rabbitfish	<i>Siganus canaliculatus</i>	No	Closed March 1 thru May 31	Illegal to buy or sell during closed season
Berdebed, kemedukl	Humphead parrotfish	<i>Bolbometopon muricatum</i>	25 inches from beak to centre end of tail.	Open	No export whatever the size.
Ngimer; maml	Humphead wrasse (also known as Napoleon Wrasse)	<i>Chelinus undulatus</i>	25 inches from tip of snout to end of tail.	Open	No export whatever the size.
Aquarium Species	Various fish, anemones, jellyfish, sponges, crustaceans, and mollusks.		No	Open	Fishing & export restricted to people in possession of an Aquarium Collecting Permit.

4.2 Harvest of Invertebrates

DESCRIPTION OF MANAGEMENT ISSUE

Invertebrates including crustaceans (e.g. crabs, lobsters), molluscs (e.g. clams, trochus, oysters), sea cucumbers and sea urchins have been, and still are, heavily harvested from the Rock Islands-Southern Lagoon Area. Hard corals are also harvested to a small extent for the production of lime, a key ingredient for betel nut chewing. As noted in the case of fishing, the Management Area is probably the most intensively harvested area in Palau due to its close proximity to the main population center of Koror.



Figure 10. A brightly colored Tridacna clam at Ngerechong Reef.

Invertebrates are harvested both commercially and non-commercially with overlap between these two as many people sell some of their harvest although their primary intent is recreation or subsistence. But some harvesters focus almost exclusively on commercial harvesting to supply the local food market and the many local restaurants, especially those catering to tourists. There is some commercial export of trochus (during designated trochus seasons) and cultured giant clams but the export of mangrove and coconut crabs, lobsters, and wild giant clams is prohibited.

The high level of invertebrate harvesting in the Rock Islands Management Area has led to apparent declines in invertebrate populations evidenced by reduced harvest levels and increased difficulty in finding:

- Sea urchins, sea cucumbers and molluscs in seagrass beds;
- Land crabs and coconut crabs in the Rock Islands (beaches and forests),
- Mangrove crabs and molluscs in mangrove areas, and
- Molluscs and lobsters on coral reefs, particularly giant clam species that are targeted for meat - *Tridacna* and *Hippopus* spp.

In addition, development activities and run-off of soils and pollutants from land close to Koror, have led to the degradation and loss of adjacent mangrove and seagrass areas and invertebrate habitat.

There is little data to validate these impacts except reports from harvesters about difficulty finding invertebrates in traditional harvest areas, such as Ngederrak Reef, where they were once abundant. Some harvesters have even shifted to alternative, less-preferred species, which are easier to find. Community concern over dwindling invertebrate numbers at Ngederrak Reef has been so great, that it prompted Koror State to enforce a 2-year moratorium on all harvesting in December 2000. This moratorium was extended a further 2 years through January 2005 to give fish and invertebrate populations adequate time to reproduce and mature, and allow scientific studies to determine the effectiveness of the moratorium. If the moratorium is effective, benefits will not only be seen within Ngederrak Reef but also in other areas. As well as an increase in the numbers and species of fish and invertebrates, larger body size and mass are often observed within protected areas, resulting in greater productivity (PISCO, 2002). This in turn supplements areas outside of the protected area as animals move away and more larvae is dispersed.

The following management actions are aimed at reducing harvesting pressure and further habitat loss to assist the recovery of invertebrate populations.

Table 4. Koror State Land Crab Regulations

The harvesting restrictions listed in Table 2 also include invertebrates. In addition, the Koror State Land Crab Act prohibits the taking, possession, and sale of live or dead land crabs (rekung el daob, rekung el beab, and kesuar) from midnight on the second day before the day and night of the full moon, and on the day and night of the full moon for a total period of 3 days around the time of each full moon. The act also prohibits the taking of undersize land crabs, smaller than 3 inches (largest carapace width) and the taking, possession, sale, exchange of land crabs with eggs (berried) at any time.



Figure 11. A land crab. Photo by Ilebrang Olkeriil.

MANAGEMENT ACTIONS - INVERTEBRATE HARVEST

Objectives:

- ❖ Provide for sustainable harvesting in the management area, with priority to Koror residents, and with the minimum amount of regulation necessary to maintain invertebrate resources for the future.
- ❖ Minimize further loss of invertebrate habitat, allow depleted areas to recover, and manage harvesting pressure to achieve an increase in the health of invertebrate populations within the Rock Islands Management Areas in the next 5 years.

Review, modification and development of regulations

- Maintain existing fishing regulations, conservation and no-take areas (subject to additions and changes described below.)
- Delete in its entirety Koror municipal ordinance No. 48-69 (effective June 16, 1969), which set aside 6 reefs as trochus breeding sanctuaries. This law is no longer enforced and the designated reef areas are not optimal.
- Establish a preservation zone at Kmekumer Islands, with no access to this area except for scientific research, monitoring and law enforcement.
- Give Ngederrak reef long-term protection, by designating it a preservation zone, with no access to areas except for scientific research, monitoring and law enforcement.
- Protect coconut and land crabs, their habitat, foraging and nesting areas through inclusion of forest and beach areas in conservation and protection zones.
- Investigate the feasibility of restricting sea urchin harvest and develop appropriate regulations.
- Explore feasibility and need to restrict harvest of giant clams (e.g. through size and bag limits, moratorium on some species).
- Explore the feasibility and need to regulate harvest of hard coral for lime production.

Enforcement of regulations

- Maintain regular 24-hour surveillance of fishing areas to check for illegal fishing activities (with daily variation of patrol routes).

Education and awareness

- Publicize harvesting regulations and conservation areas through brochures, posters, newspaper, radio and television, and signs on docks or other public places.
- Develop and implement targeted awareness and education programs for resource users (including tourists) to increase their knowledge and understanding of the importance of invertebrate resources and the reasons for regulations and restrictions.

⇒ Corresponding notes

See Table 4 and 5.

Suitable trochus reserve areas are already incorporated into no-take zones.

Kmekumer Islands provides critical habitat for hawksbill and green sea turtles, dugong, large giant clam, coconut crab, fruit bat, megapode and the endemic palm. See zone 5.2.4.

Ngederrak reef is critical habitat for dugong, and an important nursery area for fish and invertebrates. See zone 5.2.4.

See Chapter 5 for location of zones and conditions.

A seasonal or total ban may be necessary to restore sea urchin populations.

Some species may require a long-term moratorium to allow recovery.

Koror State law K6-121-2001 prohibits unlawful damage, destruction or degradation to any portion of the coral reef ecosystem.

Patrols are undertaken by Koror State Rangers. Increase frequency of patrols if possible (dependent on staffing).

The aim is to make all fishers fully aware of invertebrate harvesting regulations.

Subjects will include the life cycle of valuable/at risk macro invertebrate species (e.g. giant clams, coconut crabs), why they need protection, need for size restrictions, and benefits of marine protected

- Publicize in the newspaper and the radio the results of invertebrate monitoring programs and significant changes in invertebrate-stocks.

Research and monitoring

- Encourage and support research into the life cycles and abundance of vulnerable invertebrate species such as sea urchins, coconut crabs and land crabs.
- Establish permanent monitoring transects at Ngerumekaol spawning aggregation site to monitor invertebrate populations.
- Continue annual monitoring of fish and invertebrates at Ngederrak reef and designated control reefs.
- Conduct annual monitoring of fish and invertebrates at permanent monitoring sites at German Channel, Ngemelis and Ngerechong.

areas/conservation areas.

The public needs to be informed of the impacts of resource use and of management actions such as protected areas so they can see the benefits of improved management.

Koror State may conduct monitoring, or work with other organizations such as PICRC or Bureau of Marine Resources.

Koror State may conduct monitoring, or continue to work with CRRF.

Palauan name	Common name	Scientific name	Minimum size	Harvesting season	Other restrictions
Cheraprukl; Raikilius; Bleyached; Melech	Rock Lobsters	<i>Panulirus versicolor</i> <i>Panulirus penicillatus</i> <i>Panulirus longipes femorstriga</i>	6 inches total length of the carapace	Open	No export; no taking of egg-bearing females whatever the length
Emang	Mangrove crab	<i>Scylla serrata</i>	6 inches greatest distance across the carapace	Open	No export; no taking of egg-bearing females whatever the length
Ketat	Coconut crab	<i>Birgus latro</i>	4 inches greatest distance across width of carapace	Open	No export; no taking of egg-bearing females whatever the length
Oktang Ribkungal Kism Melibes Oruer Duadeb Duaedeb	Giant clams	<i>Tridacna gigas</i> <i>Tridacna squamosa</i> <i>Tridacna derasa</i> <i>Tridacna maxima</i> <i>Tridacna crocea</i> <i>Hippopus hippopus</i> <i>Hippopus porcellanus</i>	No	Open	No export (except cultured specimens)
Semum	Trochus	<i>Trochus niloticus</i>	3 inches basal diameter	Designated from year to year by OEK	State Government can designate closed areas during open seasons
Chesiuch	Blacklip pearl oyster	<i>Pinctada margaritifera</i>	4 inches diameter across the shell	Closed August thru December	
Bakelungal chedelkelek Bakelungal cherou Molech Badelchelid Eremrum Temetamel	Sea cucumbers	<i>Holothuria nobilis</i> <i>Hothothuria fuscogilva</i> <i>Holothuria scabra</i> <i>Actinopyga mauritiana</i> <i>Actinopyga miliaris</i> <i>Thelenota ananas</i>	No	Open	No export
	Sponges, hard corals, marine rock	<i>Porifera</i> sp. <i>Scleratinia</i> , <i>Hydrocorallina</i> , <i>Coenothecailia</i> , <i>Stolnifera</i>	No	Open	No export

4.3 Declining Turtle Populations

DESCRIPTION OF MANAGEMENT ISSUES

There are two main species of sea turtles found in the Rock Islands Management Area: green turtles (*Chelonia mydas*) and hawksbill turtles (*Eretmochelys imbricata*). Other turtle species, including the loggerhead, olive ridley and the leatherback are only rarely sighted.



Figure 12. A hawksbill turtle at Ngerumekaol.

The Management Area provides important habitat for both nesting and resident turtle populations and is one of the most important nesting areas for hawksbill turtles in Palau and regionally. Hawksbill turtles are listed by The World Conservation Union (IUCN) as “critically endangered”, and “endangered” by the U.S. Department of interior. Green turtles are listed as “endangered” by the IUCN, and “threatened” by the U.S. Department of Interior. The trade of both Hawksbill and Green turtles is prohibited by the Convention of International Trade of Endangered Species (CITES).

Turtles play a significant role in the Palauan culture, and have been traditionally used for *toluk*, jewelry and for food. However, recent studies have shown that most people think that turtle populations are seriously declining, that their average size is decreasing, and that there is much less successful nesting than in the past (PCS, 2002). Together, the results of these studies are a serious cause for concern for the future of turtle populations in Palau and suggest the need for increased control of harvesting, improved monitoring and other management actions to restore and maintain turtle populations for the future.



Figure 13. Hawksbill turtle shell is used to make “Toluk” a form of traditional Palauan money. Photo by Ilebrang Olkeriil.

Harvesting of turtles takes place both within the Rock Islands area, outside the Rock Islands area and during the time turtles are traveling to other foraging or nesting areas beyond Palau. Locally, hawksbill turtles are primarily harvested for their shell, which is used for traditional items, and for jewelry for sale to tourists. Adult green turtles are harvested for their meat, which is considered a delicacy. The eggs of both species are taken illegally for food. A few men deliberately target turtles, although most harvesting is more opportunistic. Overall, the harvest is driven by the desire for extra money, status for the hunters, traditional obligations, and the desire to eat turtle meat.

While there are specific actions that can be undertaken locally to address most threats facing turtles, the control of harvesting outside of Palau will require significant investments of time and money and international and regional cooperation.

Table 6: National Regulations for Turtle Harvest					
Palauan name	Common name	Scientific name	Minimum size	Harvesting season	Other restrictions
Melob	Green Turtle	<i>Chelonia mydas</i>	34 inches carapace length	Closed June thru August & Dec thru Jan.	No taking of eggs, no taking of female while she is on shore.
Ngasech	Hawksbill turtle	<i>Eretmochelys imbricata</i>	27 inches carapace length.	Closed June thru August & Dec thru Jan.	No taking of eggs, no taking of female while she is on shore.

MANAGEMENT ACTIONS - DECLINING TURTLE POPULATIONS

Objectives:

- ❖ Decrease turtle and turtle egg harvesting, and increase the number of hawksbill turtles nesting and eggs hatching and the overall number of hawksbill and green turtles within the Rock Islands Management Area during the next 5 years.
- ❖ In the long-term, restore the health (sex ratio, size distribution) of hawksbill and green turtle populations in the management area.

Review, modification and development of regulations

- Establish a “wildlife preservation reserve” at Kmekumer Islands for the protection of Hawksbill nesting beaches, nesting turtles and eggs.
- Include critical turtle habitat, foraging areas, and nesting areas in a “conservation zone”.
- Maintain accessibility of nesting beaches for turtles (limit infrastructure and disturbances).
- Support existing national laws and work with the national government to improve existing laws.

⇒ **Corresponding notes**

This will be adjacent to the existing reserve at Ngerukuid and have similar restricted access. See zoning 5.2.5.

Areas in the zone will include Euidelchol Island beaches.

See sections on tourism and recreation, and construction and development for more details.

This would build on existing national turtle harvesting laws (Table 6).

Enforcement of laws and regulations

- Assist Division of Fish and Wildlife to strengthen enforcement of laws against harvesting turtle eggs and turtles (size and seasonal bans) through more turtle patrols and random checks of boats.
- Regular patrols to enforce reserves and conservation zones relevant to turtles.

Work with the Ministry of Justice and Attorney General’s Office to establish the State’s authority to enforce national laws.

Education and awareness

- Develop and implement a turtle awareness campaign focusing on the following issues:
 - Increasing awareness of size and seasonal restrictions on turtle harvesting.
 - Increasing public awareness on the importance of limiting disturbance of nesting turtles and protecting nests.
 - Increasing awareness of turtle life cycle, why turtles are endangered, their cultural significance and why it is important to protect them.
- Develop and implement a turtle awareness campaign that targets tourists specifically to discourage them from buying of turtle products in Palau.

These campaigns may be implemented through partners such as PCS and should build on the previous national turtle campaign developed by PCS. .

Should include information at the airport and in “Alii” tourist magazine, as well as brochures and signs in public places.

Research and monitoring

- Support national turtle project to assess all beaches for nesting activity to determine a nesting baseline.

Work with Bureau of Marine Resources.

- Establish a monitoring program on nesting frequency of hawksbill and green turtles at key nesting sites.
- Establish a monitoring program on turtle numbers to evaluate impacts of turtle harvesting in Palau and determine how effective existing harvesting restrictions are.
- Encourage and support research on nesting success rates and healthy levels of nesting.
- Assist national or regional efforts to establish a turtle-tagging program to find out range of hawksbill and green turtles

Based on findings of national turtle project.

Based on traditional knowledge, expert opinion, and scientific research.

To determine if turtles migrate to international waters and where to focus our regional conservation efforts.



Figure 14. A green turtle returning to the ocean after nesting.



Figure 15. A Hawksbill turtle. Photo courtesy of PCS.



Figure 16. School children learning about turtles through play. Photo courtesy of PCS.

4.4 Endangered Dugongs

DESCRIPTION OF MANAGEMENT ISSUE

The Management Area contains important foraging and resting areas for dugongs, with Malakal harbor being one of the most important dugong habitats in Palau.

The dugong (*Dugong dugon*) or *mesekiu* population in Palau is the most isolated in the world, and under imminent threat of extinction if the number of dugongs killed in Palau each year does not decrease. Palau's small dugong population is the only population in Micronesia, with only occasional sightings in Yap and Guam (Nishiwaki et al. 1979). Thus it is highly unlikely that the local dugong population can be supplemented by dugong migration from other areas, as the nearest dugong populations are 800 km south of Palau in West Papua and 850 km west in the Philippines (Marsh 1992).



Figure 17. The rarely observed dugong. Photo courtesy of PCS.

The dugong is threatened globally, and is listed “vulnerable to extinction” by the International Conservation Union (IUCN), and “endangered” by the U.S. Department of Interior. Its trade is also prohibited by the Convention of International Trade of Endangered Species (CITES).

In addition to its ecological significance, the dugong is culturally important to Palau history and traditions. It is one of four animals that symbolize the strength and values of Palau's traditional leadership system (Palau Society of Historians, 1998). Dugong vertebrae were a sign of great prestige and high rank and were once worn on the wrist of high chiefs and noted warriors. Today much of the traditional value of dugongs has been lost, although dugong meat is still considered a delicacy by some.



Figure 18. This dugong was killed by collision with a large motor boat in Moreton Bay, Australia. Photo courtesy of Queensland Department of Environment, Australia.

This continued desire to eat dugong meat is threatening Palau's dugong populations. Although the hunting and killing of dugongs is prohibited in Palau, dugong hunting is still known to occur (PCS, 2003). Research has shown that dugong populations can only sustain a 2% harvest level of females due to their slow reproductive cycles (Marsh, 1992). This means that only 2 female dugongs can be killed each year, assuming dugong population of 200. It is likely that more than 2 females are harvested yearly in Palau as hunters are known to target females and calves (PCS, 2003).

Injury and death caused by motorboat collision also threatens the survival of dugongs in Palau. It is clear that if dugong mortality does not decrease considerably, dugongs will become extinct in the management area and Palau.

The following management actions are designed to supplement existing national legislation that protects dugongs. Stricter national legislation including stiffer penalties for violation of the law (up to \$20,000 fine) was approved in 2003.

MANAGEMENT ACTIONS - ENDANGERED DUGONGS

Objectives

- ❖ Protect the dugong population in the Management Area from illegal harvesting and prevent death and injury caused by boat collisions.
- ❖ In the long-term, restore the dugong population in the Management Area to a healthy population size.

Review, modification and development of regulations

These actions will supplement existing national laws that protect dugongs.

- Give Ngederrak reef long-term protection, with no-take, and no motorboat access to areas except for scientific research, monitoring and law enforcement.
- Identify and protect additional critical dugong habitat areas.
- Investigate the need and feasibility of implementing control measures to reduce the risk of motorboat collision with dugong, and implement measures if necessary.

Enforcement of laws and regulations

- Assist the Division of Fish and Wildlife to strengthen enforcement of laws prohibiting harvesting of dugongs.

Education and awareness

- Support national government efforts to increase public education about dugongs.
- Maintain regular daily patrols of Ngederrak Reef to check for illegal entry and fishing activities.

Monitoring and research

- Support research on the ecology of the dugong population in Palau.
- Support the continuation of aerial surveys of dugongs through in-kind or financial assistance. Surveys should be repeated every 5 years.
- Support seagrass surveys in Koror State to identify preferred dugong foraging areas.
- Monitor the status of dugong habitat every 5 years.

⇒ **Corresponding notes**

Ngederrak reef is critical habitat for dugong, and an important nursery area for fish and invertebrates.

Refer to research actions below. Include habitat areas in conservation zones or other protection zones if possible.

Measures include: reducing motorboat access, restricting the speed of travel, or installing dugong cautionary signs in critical dugong habitat.

Work with the Attorney General's Office to establish the State's authority to enforce national laws.

New national dugong legislation requires the development of educational programs about dugongs.

Provide in-kind or financial assistance to researchers.

Surveys have been done in 1978 (Brownell et al.), 1983 (Rathbun et al.), 1991, (Marsh et al.) & 2003 (C3).

Dugongs prefer certain seagrass species, thus not all seagrass beds provide suitable foraging habitat.

See Palau Dugong Action Plan (1998) for more details.

4.5 Forest/Terrestrial Issues

DESCRIPTION OF MANAGEMENT ISSUE

The Rock Islands support three main types of forest. Limestone forests growing over most of the Rock Islands; strand forest growing along flatter areas behind beaches; and mangrove forests, mainly around the marine lakes. Each of these are a unique forest types and although they are not well studied, are likely to contain a number of endemic species (found only in Palau or possibly just in the Rock Islands). Manner and Raulerson (1989) reported 123 species of plants in the Ngerukuid Islands, most of them endemic. The endemic palm, *Gulubia palauensis*, is considered to be endangered and has disappeared from many of the Rock Islands.



Figure 19 Dense limestone forest and strand vegetation at Ngeremdiu.

While the Rock Islands forests are a key part of the unique landscape that attracts tourists to Palau, they are also important habitat for rare birds and animal species. A large number of bird species are found in the Rock Islands, along with a unique variety of the Marianas Fruit Bat, *Pteropus mariannus pelowensis*, which is endemic to Palau and common in the Rock Islands. A variety of lizards and snakes make their home here. The Rock Islands are important habitat for the Micronesian megapode, which is also listed on the global endangered species list. Many other birds are sighted and some appear to be limited to the Rock Islands. Two, the Nicobar pigeon and the blue-faced parrot finch, have been recommended for listing as endangered. Engbring (1992) found Nicobar pigeons to have their highest population densities in the Rock Islands and found the blue-faced parrot finch only in the Rock Islands. The Palau greater white-eye appears to be restricted to Ngeruktabel and the Palau ground dove largely restricted to the Rock Islands. Several seabirds, including the Audubon shearwater, the bridled tern, and the black-naped tern, also appear to be restricted to the Rock Islands. In one study, 23 species of birds were recorded in the Ngerukuid islands (Birkeland & Manner, 1989).

The forests of the Rock Islands are generally in good condition as they have been well protected by the steep and difficult terrain, and by strict controls on harvesting of trees from the area. They are, however, especially vulnerable to disturbance because of the very thin and poor soil on the rock islands. Invasive species also pose a threat that must be monitored and managed, as invasive plants such as *Mikania micrantha* (mile-a-minute vine) would be very difficult to control if they became established on these islands and could rapidly smother and kill native vegetation. Invasive animals already have some negative impacts. For example, it is suspected that the introduced Sulphur-crested cockatoo that eat the heart of the Rock Islands palm (*Galubia palauensis*) may be preventing its natural reproduction. Invasive rats are established on some of the islands and are likely to be eating the eggs and having negative impacts on the numbers of some bird species. The monitor lizard may be having a similar impact.

Hunting of birds and bats is thought to have resulted in a decrease in the numbers of fruit bats, Nicobar pigeon, Micronesian pigeon and Micronesia megapode (poaching of eggs). Hunters are supplying a local demand from both an informal market (for banned species) and to a lesser extent the local stores and restaurants. The demand comes in part from customary/traditional obligations, and also the desire to eat delicacies or 'exotic' species, especially among tourists. In general, hunters harvest these birds to earn extra cash, but also at times for recreation and for social status.

The management actions below are intended to address these threats and to maintain both the essential natural forest cover and the diversity of bird and animal species that depend on the forests for their survival.

MANAGEMENT ACTIONS - FOREST AND TERRESTRIAL ISSUES

Objectives:

- ❖ Maintain the natural forest cover, including mangroves, on all of the Rock Islands and prevent the introduction and spread of invasive plants and animals.
- ❖ Control the level of harvest of fruit bats and native birds to ensure that healthy populations of the full range of native species are maintained.
- ❖ Allow limited harvest of timber for traditional/cultural use under a specific approval process on a case-by-case basis.

Review, modification and development of regulations

- Maintain the existing law preventing cutting of mangroves or other vegetation below the high-tide line.
- Ensure that all timber harvested in the Management Area is approved by the Traditional Leadership and State Government.
- Prohibit the planting of introduced ornamental/exotic species in the Management Area. Ensure that any new development projects plant only native species that already occur at the site.
- Prohibit taking of domestic animals such as cats, dogs or monkeys to the management area.
- Maintain existing regulations that prohibit the taking of any fauna or flora from tourist areas.
- Include key roosting sites of fruit bats and nesting sites of Micronesian Megapodes in preservation and conservation zones where possible.
- Support national efforts to develop workable regulations for the Endangered Species Act.
- Develop regulations to prohibit the harvesting of all birds and bird eggs except for introduced species in the Management Area.

Enforcement of regulations

- Review regular surveillance patrols to ensure they adequately cover terrestrial areas for enforcement of state regulations on mangroves, harvesting of fruit bats and birds, and protection of flora and fauna on the Rock Islands.
- Assist Division of Fish and Wildlife to enforce relevant national laws. eg. Laws on bird harvest.

Education and awareness

- Increase awareness of all regulations relating to plants and animals of the Rock Islands.
- Develop and implement targeted awareness and education programs for resource users to increase their knowledge and understanding of the importance of terrestrial habitat and resources, and the reasons for regulations.

Research and monitoring

- Support and encourage surveys of fruit bat and bird populations, critical habitat and nesting areas.
- Support and encourage research into sustainable harvest levels and seasons for fruit bats and pigeons.

⇒ **Corresponding notes**

See Koror State Public Law K6-2110-00

Refer to Section 4.10-Control of Invasive Species for further information and details of eradication programs.

Refer to section 4.10 on control of Invasive Species for more information.

See Chapter 5 for description of tourism areas.

Refer to Chapter 5 for description of zones.

Proposed regulations will protect listed endangered and threatened marine and terrestrial species.

Work with the Attorney General's Office to establish the State's authority to enforce national laws.

The aim is to make all resource users fully aware of harvesting regulations.

Subjects will include the importance of mangroves to marine lake ecosystems, the life cycle of valuable/at risk plants and animals. Refer to Section 4.10 for Invasive Species campaigns.

To look at feasibility of closed seasons.

- Support and encourage research into cockatoo and eclectus parrot populations, their impact on the native palm and control measures.
- Assess and regularly monitor the distribution and area covered by invasive plant species on the Rock Islands.
- Support vegetation surveys (including mangroves) of the Rock Islands.

Refer to Invasive Species section 4.10. Get assistance from the BoA and National Invasive Species Committee.

The U.S. Forestry service surveyed several sites in 2003. Coordinate with Forestry (Bureau of Agriculture).



Figure 20. Strand forest at Ngeremdiu.



Figure 21. The Biib (Palauan fruit dove). Photo courtesy of PCS.



Figure 22. The Rur (Rock Island Lilly). Photo by Charlene Mersai.

4.6 Climate Change

DESCRIPTION OF MANAGEMENT ISSUE

The devastating effects of climate change were seen in the Management Area in 1998, when significant coral bleaching occurred throughout Palau. Approximately 30-35 % of Palau's corals were bleached and killed, during the 1997/98 El Niño-Southern Oscillation event, when local sea surface temperature rose above normal for an extended period of time. Many reefs within the Management Area, including popular snorkeling and dive sites were devastated, some with up to 100% mortality.



Figure 23. Bleached white coral and colorful healthy coral directly above it.

Corals bleach in response to substantial environmental stress such as a prolonged increase in water temperature. The process is called bleaching because a stressed coral expels the colorful symbiotic algae that is growing within its tissue and the remaining, colorless tissue and skeleton is stark white. Corals cannot survive long without their algae as it provides their main energy source. Most of the heavily impacted reef areas have been slowly recovering since the 1998 event.

Climate change induced impacts such as El Niño, increased seawater temperature, and UV radiation, may also be affecting the occurrence of diseases in coral. Several coral diseases have recently been identified in the Management Area. Their occurrence should be monitored as disease has caused widespread mortality in reef building corals around the world (NOAA, 2004).

The marine lakes were also heavily impacted in 1998, particularly Ongeim'l Tketau (Jellyfish Lake) where significantly elevated water temperatures caused the disappearance of the medusa stage - the bell-shaped, floating jellyfish - of the *Mastigias* Jellyfish. Fortunately the polyp stage - stalk like structure that is attached to the sediment floor- was able to withstand the unusually high temperatures. So with the next generation of jellyfish surviving, the population appears to be bouncing back over the last several years.

Other longer term threats include increased storm activity and resultant tidal surges, which is also believed to be linked to changes in global weather patterns. This may lead to increased storms and tidal surges resulting in further erosion of beach areas, and consequential loss of beach vegetation and nesting areas for Hawksbill and Green Turtles. This is expected to continue and intensify as sea levels rise in the next century, inundating low-lying areas within the Management Area. Regular climatic fluctuations such as typhoons and droughts could lead to changes in the diversity of plants and the structure of forests on the Rock Islands because species that are more tolerant to drought and higher temperatures may become more common than less tolerant species.



Figure 24. Vast areas of corals bleached in 97/98 El Niño Event. Photo courtesy of Norbett Wu.

Overall, the impacts of climate change and global warming such as changes in sea surface temperature, weather patterns, tidal patterns and climatic regimes are expected to become more frequent and severe over time. Thus it is imperative that we begin to prepare for these impacts now to maximize the survival and recovery potential of coral reefs within the Management Area. The following management actions begin this preparation.

MANAGEMENT ACTIONS - CLIMATE CHANGE

Objective:

- ❖ Enhance the resilience of coral reef systems in the Rock Islands-Southern Lagoon area to climate change by including key resistant and resilient areas throughout Palau in a nationwide network of protected areas designed to maximize survival and recovery following coral bleaching events.

Review, modification and development of regulations

- Support efforts to establish a network of protected areas throughout Palau.
- Establish additional protected areas and/or modify existing areas to include areas resistant and resilient to coral bleaching and connectivity associated with source and sink areas.
- Support existing national strategies for response to climate change, including strengthening coral reef protection.

Education and awareness

- Support national efforts to increase awareness of climate change and its impacts.

Research and monitoring

- Support studies on coral reproduction, recruitment and dispersal.
- Support studies to identify areas resistant and resilient to coral bleaching, and sources and sinks of larvae and coral recruits.
- Support the development of remote sensing techniques to design effective networks of protected areas, monitor coral reef health, and provide an early warning system of climate-induced stress.
- Support research into the effect of climate change induced impacts on the occurrence of coral disease in Palau.
- Develop an early warning system and response strategy for coral bleaching or other natural events.
- Monitor limestone forests and coastal vegetation on the Rock Islands following extended droughts to check for establishment of invasive species, and remove any that have established.
- Establish a long-term program to monitor shoreline erosion.
- Continue to monitor jellyfish populations in Jellyfish Lake and other marine lakes to assess recovery from the 1998 El Nino event, and develop a response strategy for future El Nino events.
- Support research on water flow patterns in Jellyfish Lake and other marine lakes.

Corresponding notes

The Protected Areas Network (PAN) legislation was passed by the OEK in 2003.

Suitable areas will be identified through modeling and current studies being conducted by NOAA/ AIMS/ TNC/ PICRC.

OERC has developed a national implementation strategy in response to climate change.

MRD is the designated lead agency for national awareness efforts.

PICRC has ongoing studies in Nikko Bay and Nederrak Reef.

Modeling and current studies are being conducted by NOAA/ AIMS/ TNC/ PICRC/ CRRF.

The GEF-WorldBank Coral Reef Targeted Research: Remote sensing working group conducted preliminary research in the Management Area in 2004, and may select Palau as a study site.

The GEF-WorldBank Coral Reef Targeted Research: Diseases working group conducted preliminary research in the Management Area in 2004, and may select Palau as a study site.

The system will enable rangers, tour-guides etc. to report any coral bleaching. Coordinate with PICRC, GCRMN node, OERC.

Invasive species often colonize forest gaps, out-competing native species and can spread rapidly. Refer to Invasive Species Section 4.9 for more information.

KS Rangers are trained and have survey equipment. Refer to Graham 2000 for methods.

The CRRF regularly monitors Jellyfish Lake (Ongeim'l Tketau), Big Jellyfish Lake (Ngermeuangel) and Goby Lake (Utoi Lake).

Studies are critical in determining how and in what ways lakes are vulnerable to climate change and how this might vary among types of lakes.

4.7 Tourism and other recreational activities

DESCRIPTION OF MANAGEMENT ISSUE

The Rock Islands-Southern Lagoon Area is the foundation of Palau's tourism industry. Close to 60,000 tourists visited Palau in 2002, and most of them visited the Rock Islands Management area. On the doorstep of Palau's most populated island Koror, the area is also an important recreational and relaxation spot for Palau's residents. Visitors and locals enjoy the area's natural beauty through a variety of activities including SCUBA diving, snorkeling, fishing, kayaking, sea walking (walking on the sea floor with a modified scuba helmet), parasailing, banana boating, sailing, jet skiing, water-skiing, camping, picnicking and other beach activities. The area also has a number of cultural and historical attractions, including remains of ancient villages and WW II wrecks.



Figure 25. Groups of tourists eagerly ascend on the picture-perfect white sandy beaches of Kemur Beab on Babelomekang Island.

The increase in tourist numbers as well as types of recreational activities offered has led to conflicting resource uses and overcrowding at popular dive sites and tourist beaches. There are currently no controls on the number of boats, divers or snorkelers that can access a particular site at any one time, and tour-guides generally rely on unspoken industry rules and common courtesy to minimize site congestion. However, as the number of boats competing for popular dive sites increases in years to come, industry self-regulation is becoming more challenging, especially as increasing numbers of snorkelers are utilizing the same sites. The risk of boats colliding with guests is growing as motorboats trail inexperienced snorkelers in areas where divers are surfacing.

In addition to safety concerns, the increase in the number and types of visitors has placed considerable pressure on the delicate marine and terrestrial ecosystems within the management area. These are some of the concerns over the impacts of tourism and recreational activities:

- Damage to reef habitat from divers and snorkelers touching and standing on corals or removing corals or invertebrates;
- Changes in behavior and ecology of reef fish and sharks because of fish feeding and occasionally shark feeding at popular dive and snorkel sites, and beach activity areas such as Ngeremeaus;
- Algal growth at tourist activity areas where fish feeding regularly occurs;
- Changes in ecology of marine and terrestrial wildlife from increased litter, especially biodegradable scraps left at picnic areas fueling rat populations;
- Decreased success of grouper spawning activities due to divers disturbing groupers at Ngerumekaol (Ulong Channel) during spawning season;
- Disruption of nesting activities of endangered Hawksbill and Green turtles through disturbance and development of nesting beaches;
- Possible changes in the ecology of Ongeim'l Tketau (Jellyfish lake) by visitors touching and damaging jelly-fish, and altering water quality by wearing sunscreen and urinating in the enclosed waters of the lake;
- Degradation of historical sites, particularly WW II shipwrecks, by tour-guides and visitors handling and removing artifacts, including live ammunition.

The actions outlined on the following pages address these environmental and safety issues in order to enable the continuation of high quality, low-impact, safe recreational activities.

MANAGEMENT ACTIONS- TOURISM AND RECREATIONAL ACTIVITIES

Objectives:

- ❖ Provide suitable sites and basic infrastructure to support high quality tourism experiences in the Management Area that have minimal environmental impact and meet visitor expectations, but also increase their understanding of the area and inspire them to visit again.
- ❖ Maintain access to the Rock Islands for nature-based recreation by local residents that has minimal environmental impact and supports cultural values.
- ❖ Ensure sufficient financial return from tourism activities in the Management Area for sustainable management.
- ❖ Strengthen relationship between Koror State and Tour-operators.

Review, modification and development of regulations

- Maintain existing tourist activity areas, permits and regulations.
- Ensure that visitors can access all designated tourist activity areas.
- Designate a new tourist activity site at Ngkesill Island Beach and explore feasibility of opening additional new sites.
- Make it a requirement that all local caretakers must maintain their designated areas and shelters.
- Regulate diving and snorkeling activities in the Management Area to reduce site congestion and damage to corals and increase site safety.
- Continue to limit use of personal watercraft to designated water sport zones.
- Maintain existing restrictions and closures of marine lakes until research by the Coral Reef Research Foundation is completed. Closures will be re-assessed based on research findings and recommendations.
- Based on the research mentioned above, assess feasibility of permitting a limited number of tourists to visit Ngermeuangel (Big Jellyfish Lake) under strict controls.
- Require all marine tour-guides operating within the Management Area to meet the State’s marine tour guide certification standards and ensure new guides receive training and are certified to meet the standards.
- Develop and adopt guidelines for snorkeling in Jellyfish Lake, as per designation as a special use tourism zone.
- Develop and adopt guidelines for snorkeling and diving in Mandarin Fish Lake as per designation as a special use tourism zone.
- Regulate diving at Ngerumekaol (Ulong Channel) during critical spawning times (10 days before the new moon from May to August) to minimize disruption of spawning activities. Diving is permitted between 10am and 2pm, as long as divers follow the guidelines for diving during spawning season outlined in the tour-guide certification manual, and comply with conservation zone

Corresponding notes

See Table 7.

Some areas are not accessible due to land ownership disputes. This includes Ngeremdiu beach, Ngeanges Island, and Ngchelobel beach.

See section 5.2.3. for description of zone. Additional sites may need to be developed as visitation increases.

If sites are neglected, caretakers will have to reimburse the State for cleaning expenses.

See section 5.2.3 for description of tourist activity zones.

See section 5.2.3 for description of water sport zones.

Tourists are only permitted to visit “Jellyfish Lake” (Ongeim’l Tketau). Tourist access to all other lakes is not allowed.

May be needed to ease congestion at Jellyfish lake in the next 5 years.

See attachments for a copy of the marine tour guide certification program manual. The course will be implemented in 2004 and regulated in 2005.

Refer to zoning section 5.2.3 for zoning restrictions. Guidelines will be developed in consultation with scientists, PVA and BTA and included in the tour-guide training manual.

Groupers begin to aggregate 10 days before the new moon, with numbers peaking 5 - 1 days before new moon. Courtship activity is greatest in the morning and afternoon with spawning occurring at night. Spawning activity is greatest from May - August although

regulations (zoning section 5.2.4). SCUBA diving is prohibited, except for research purposes, between 2pm and 10am, 10 days before the new moon from May - August.

- Develop and implement comprehensive water safety regulations for Koror State, including safety equipment requirements, and limiting passenger number on boats, to increase the safety and quality of all water activities and tours in the Management Area.
- Ban feeding of sharks in the Management Area.

Enforcement of regulations

- Maintain regular 24-hour surveillance of tourist activity areas to check for illegal fishing activity and compliance with tourism regulations.
- Conduct intensive monthly checks for Rock Island use and fishing permits on all vessels and at tourist activity areas.
- Work with Peleliu State and MEERT to strengthen protection of dive sites south of German Channel by coordinating and supporting enforcement of regulations in Koror and Peleliu waters.
- Enforce boat safety regulations.

Education and awareness

- Continue to strengthen communication and cooperation between Koror State and tour-operators through regular meetings, and liaison with tour groups.
- Designate a tourism liaison person at Koror State (and make this known to PVA, BTA and all tour operators).
- Work with local tour guides and agencies to implement the marine tour guide certification program for Koror State.
- Publicize tourist activity areas and regulations, including Rock Island Use Permit information, through brochures, maps, posters, and publications such as the "Alii" visitor magazine, radio, and television. This information will also be presented in the tour-guide training course.
- Develop educational and awareness material for tourists and locals explaining the environmental and cultural significance of the Rock Islands-Southern Lagoon Area and how they can help protect it.
- Develop a litter awareness campaign to encourage all visitors to the Management Area to reduce the amount of trash they produce and take all trash with them when they leave, including food scraps and cigarette butts, and reasons why.
- Encourage tour-operators to reduce the amount of trash they generate by using reusable containers and biodegradable packaging.
- Work with tour-operators to develop a coral reef monitoring program to assess diver and snorkeler impacts on key dive and snorkel sites, increase environmental awareness, and strengthen

spawning occurs throughout the year.

Water safety regulations were developed by the State in 1995, although not formalized. Some regulations are covered under regulations for boating registration and national laws - although they are not comprehensive. See attachments for regulations.

Shark feeding can create a safety hazard and alter the natural behavior of sharks. Shark feeding was recently banned in Florida, Hawaii and the Cayman Islands.

Patrols are undertaken by Koror State Rangers.

Randomly select 3 days per month to check every vessel and tourist beach.

An MOU between Koror and Peleliu States is currently being developed. MEERT is the marine environment enforcement resource taskforce.

KS should continue to attend BTA meetings, and start giving informal presentations to tour-groups.

The Rock Islands Development Officer is the current contact.

PCS will coordinate implementation.

Surveys shows that visitors are more willing to pay park fees, if they know what the fees are used for. Brochures should be distributed with Rock Island Use Permits and posters provided to all tour-operators.

This could include information stands at the airport, dive shops, PVA and include a catchy slogan encouraging environmental stewardship. This will complement the tour-guide training manual.

This will compliment information covered in the tour guide training manual and target tourists, locals and tour guides and operators. Build on existing national campaigns conducted by C3 and EQPB.

Encourage the use of reusable and biodegradable containers. This is also covered in the tour guide training manual.

Design a monitoring program based on the management objectives. Work with the Palau GCRMN node and the Coral Reef Alliance to develop this

relationships between the government and tourism industry.

Research and monitoring

- Conduct regular monitoring of key dives sites to assess long-term impact from divers and snorkelers.
- Encourage and support research to determine the impacts of diver disturbance on grouper spawning activities.
- Encourage and support research to assess if Manta Rays are being impacted by diver disturbance at cleaning stations.
- Support research on water flow patterns in Ongeim'l Tketau and other marine lakes.
- Monitor erosion of beach areas through regular surveys and visual comparisons of photographs over time.
- Regularly monitor the number of visitors, and their activities, at tourist areas including Jellyfish Lake, dive sites and beaches, and develop a database to consolidate results.
- Conduct regular visitor and tour operator satisfaction surveys to get feedback on management strategies.
- Support and encourage research to determine the ecological and infrastructure carrying capacity of popular dive sites and tourist areas.
- Assess the feasibility of placing restrictions on tourist numbers at sites where congestion is a problem or carrying capacity is being exceeded.
- Explore feasibility of developing a special 'eco-friendly operator accreditation' to reward environmentally conscious operations, including restaurants that comply with wildlife regulations (with any breach of regulations resulting in loss of accreditation).

Management of recreational activities

- Install and maintain mooring buoys at all regularly dived shipwrecks, snorkeling sites and other frequently used tourist sites.
- Maintain composting toilets and basic shelters at tourist activity areas on the Rock Islands.
- Open designated tourist activity areas that are not currently accessible to all tourists. This includes the development of basic shelters and composting toilets.
- Develop site plans for tourist beaches that include recommended maximum user capacity based on facilities, and a maintenance program to maintain the natural environment and visitor amenity.
- In addition to facilities provided at tourist areas, provide basic shelters and composting toilets at popular areas that are used by locals.
- Explore feasibility of improving the RIMA permit to enhance its marketability, durability and management, and undertake periodic reviews of permit fees to ensure that they continue to provide the necessary funding for sustainable management.

program.

Continue monitoring of Ngemelis, German Channel, Ngerechong and Ngerumekaol.

Although disturbance of groupers during courtship could reduce the numbers of fish that successfully spawn, the impacts on reproductive output are unknown.

The manta cleaning stations at German Channel are one of the most popular dive sites in Palau.

Studies are critical in determining how long water or compounds in the water (e.g. Sunscreen) remain in the lake, and how long heat is retained.

See monitoring plan in Volume II for details.

This will enable more assessment of visitor impact and site carrying capacity. See monitoring plan in Volume II for details.

See monitoring plan in Volume II for details.

Work with scientists, PVA, and BTA

Work with PVA, BTA and the Coral Reef Alliance.

This would reward environmentally friendly operations and provide incentive for other operators to become more environmentally friendly. Work with PVA and BTA.

If possible buoys should be secured to the reef or substrate, not the wreck, to reduce potential structural damage.

May need to install additional toilets at popular areas if the recommended user capacity is exceeded.

These areas include Ngeremdiu Ngeanges and Ngchelobel beach.

Site plans should include location of paths (to minimize leaf clearing), shelters and composting toilets.

These areas are not open to tourists.

e.g. A durable plastic tag would be able to be worn by tourists (either attached to dive gear or carried), and would provide a souvenir of a visit to the Management Area.

Table 7: Tourist Activity Areas designated in the 2000 Rock Islands Management & Conservation Act.

Designated tourist activity areas

Jellyfish lake (Ongeim'l Tketau) on Mecherechar Island; Babelomekang Island; Ioulomekang Island; Ngeanges Island; Ngermeaus Island; Ngchelobel beach area; Ngeremdiu Todai Trail (German Lighthouse); Ulong Islands; Ngereblobang beach area; Bkul chotuut beach area. All other land is reserved for residents of Palau.

Tourists may access all water areas except Ngkisaol Sardines Sanctuary, Ngerukuid Islands Wildlife Preserve and Ngederrak Reef.

Regulations

Any visitor entering Palau on a tourist visa must have a valid Rock Island permit to use the area. The permit costs \$15 and is valid for 15 days. It allows scuba diving, snorkeling, kayaking, boat touring and land activities on designated tourist activity areas. Non-Palauan citizens and visitors must have a valid fishing license to take part in any fishing activities. License fee is \$20 per month, or \$200 per year. It is illegal for non-Palauan citizens to fish from land areas on Koror Island (includes all fringing reefs joined to land areas).



Figure 26. A few of the ways to enjoy the spectacular beauty of the Management Area.

4.8 Infrastructure, construction and development activities

DESCRIPTION OF THE MANAGEMENT ISSUE

The Koror State Public Lands Authority (KSPLA) and the Koror State Planning and Zoning Commission (KSPZC) oversee all land issues and designate land use and zoning within the Management Area. All land within the Management Area is zoned a conservation zone under Koror State Zoning Law, which allows use of land areas for parks, wilderness or shoreline preserves, flood and erosion prevention activities, and other conservation activities. A permit from the Zoning Commission is required to build any permanent structure within the management area.

Because the Management Area is zoned a conservation area it is largely undeveloped and has seen very little direct impact from infrastructure, construction and development activities. Most development has occurred on the populated islands of Koror and environmental impacts have largely been restricted to nearby areas, though occasionally fringe sections of the Management Area are affected. But development, of course, could quickly become a top threat to the ecosystems within the Management Area if it is permitted.

Development in the Management Area has been limited to the construction of basic shelters and toilet facilities (composting and pit toilets) at tourist activity areas and other popular locales. In addition, some Palauan families claim traditional rights to particular islands and beaches and reinforce these rights by maintaining summerhouses in these areas. But most of this development has been restricted to flat sandy areas above high tide and has had little impact on the surrounding environment, apart from litter and minor clearing of vegetation. The only major development activities within the Management Area has been the construction of a dolphin research facility in a sheltered bay off Ngeruktabel Island, and limited sand mining, which continues to take place in the sandy areas south of Taberrakl Reef. Although there is debate over the potential environmental impacts that the dolphin research facility could have in the future, current environmental impacts are believed minimal. The sand mining activities though could be disturbing seagrass areas, which are valuable habitat for endangered dugongs and turtles. Aquaculture activities pose a potential threat to the Management Area, if allowed to proceed without a thorough assessment of environmental impacts and before national aquaculture guidelines are established. Although there are currently no large-scale aquaculture projects within the Management Area, its clean waters and vicinity to Koror could attract interest as aquaculture develops in Palau.

Development activities on and around urban Koror have been for private and commercial purposes and have included land excavation, reclamation (filling in of coral reef, mangrove and seagrass areas), dredging activities, and mangrove clearing. In addition, residential and commercial development has created liquid and solid waste disposal issues. Solid waste is currently disposed of at the national rubbish dump at M-Dock, Koror, although there are plans to relocate the dump to Babeldaob. The sewage treatment facility, which is currently being upgraded, is located on Malakal Island and discharges treated effluent directly into the ocean. Although there are concerns over the environmental impact of both activities, limited studies have concluded that the sewage outfall is not damaging local or distant reefs (Hamner et al. 1997) and that the dump is not releasing significant amounts of waste constituents into the environment (Winzler, 1997). As both facilities are being upgraded, the risks of environmental impacts are expected to decrease, although studies are needed to confirm this. There are also localized impacts from non-point source pollution, such as run-off from storm waters (soil, oil from roads), adjacent to Koror. As all these activities fringe on the Management Area, they pose a minimal threat to the overall management area. However in order to maintain the natural state and "spectacular beauty" of the Management Area, development activities in urban Koror must be considered to some extent as well as those in the Management Area. The following actions are intended to address these issues.



Figure 27. The typical style of shelter found at tourist activity areas in the Management Area.

MANAGEMENT ACTIONS - INFRASTRUCTURE, CONSTRUCTION AND DEVELOPMENT ACTIVITIES

Objectives:

- ❖ Prevent development in the Management Area that would degrade the natural character, environment or tourism values of the area, while allowing necessary infrastructure to support better management of the area to protect those values.
- ❖ Minimize degradation and pollution impacts in the Management Area from development around Koror.
- ❖ Enable aquaculture projects in the Management Area that have negligible environmental impact.

Review, modification and development of regulations

- Maintain existing State regulations, permit and review process for all development activities, including sand mining and dredging operations.
- Encourage and support the establishment of a coordinated development review process for all proposed development activities in Koror State.
- Work with the Planning and Zoning Commission and KSPLA to ensure that environmental issues are addressed in building codes and standards for Koror State.
- Ensure any new or expanded sand mining operations in the Management Area follow appropriate procedures and are subject to environmental impact assessment and follow best practice.
- Support state and national efforts to develop an effective waste management system, including efforts to move the existing rubbish dump away from its present location and ensure adequate rehabilitation of the area.
- Support and assist the Bureau of Marine Resources to develop national aquaculture regulations and guidelines.
- Develop State criteria for aquaculture based on national guidelines.

Enforcement of Regulations

- Conduct regular surveillance of development sites and ensure that all state regulations are being followed.
- Monitor the existing sand mining operation area near Taberrakl Reef to ensure compliance with permit conditions.
- Issue citations and work with the KS Building and Zoning Department and KSPLA to take legal action if necessary.

Education and Awareness

- Develop awareness materials to increase awareness of any new development codes/regulations that affect the Management Area, through brochures, posters, newspaper, radio and television.
- Develop a litter awareness campaign to encourage all users (tourists and locals) of the Management Area to reduce the amount of trash they produce and take all trash with them when they leave, including food scraps and cigarette butts, and reasons why.

Corresponding notes

Koror State Public Land Authority and Koror State Zoning oversee development activities in Koror.

The process should be transparent and include provision for comments from agencies representing environmental, social and economic analysis.

A land Settlement agreement between Koror State and National Government is in place.

Ensure that any proposed aquaculture projects require a full environmental impact assessment.

The process for KS permitting requires appropriate permits from other agencies.

The aim is to make the public aware of building codes and regulations.

Refer to Tourism and Recreational Activities Section for more details. Build on existing national campaigns conducted by C3 and EQPB.

Research and monitoring

- Conduct more detailed research/monitoring into the impacts of the Malakal sewage outfall on the marine environment using biological indicators such as plants and animal tissues, and sediments.
- Conduct monitoring/research to determine if the Dolphins Pacific research facility, located on Ngeruktabel Island, is impacting the marine environment.
- Conduct more detailed monitoring/research to determine the impacts of the M-dock rubbish dump on the surrounding ecosystem (plants and animals).
- Support the development of a water quality-monitoring program around Koror and adjacent to development activities, including the Dolphins Pacific Research Facility on Ngeruktabel Island.
- Develop a monitoring program of seagrass and coral reef areas and include areas in the vicinity of development activities to assess environmental impact. This should include assessment of sedimentation, loss of seagrass, and damage to coral.
- Support studies on the effect of human activities (such as sewage discharge & pollution), on the occurrence of coral disease in Palau.

Previous studies on the impacts of the Malakal outfall only looked for visible signs of nutrient enrichment, measured water column nutrients and currents. Methods should include biological indicators such as plants and animal tissues, and sediments and could be combined with studies on the Malakal outfall (above). Studies should examine nutrients, heavy metals and other toxicants in sediment, plant/animal tissue and water.

Work with EQPB to develop and implement the monitoring program. The aim is to assess changes

Monitoring should be conducted annually for the first 2-3 years, then reduced to every 3-5 years unless there is a specific event (typhoon, beaching, oil spill etc.).

The GEF-WorldBank Coral Reef Targeted Research: Diseases working group conducted preliminary research in the Management Area in 2004, and may select Palau as a study site.



Figure 28. Soil is eroded from land into adjacent waters after heavy rain. Photo courtesy of PICRC.



Figure 29. The Dolphins Pacific Research facility at Ngeruktabel.



Figure 30. Development on Malakal Island, Koror.

4.9 Boating

DESCRIPTION OF MANAGEMENT ISSUE

Boating is an essential part of Palau’s way of life and economy. Boats are used both privately and commercially for transport between islands and to dive and snorkel sites, for fishing, and recreational activities such as water-skiing. The majority of boats traveling within the Management Area are small motorboats (less than 25 feet), although personal water craft (jet skis) are permitted within designated zones and larger motorboats are also used for commercial fishing, tourism activities and as live aboard dive vessels. Large commercial container ships also have restricted passage through the Management Area via established deep channels into Malakal Harbor. In addition to motorboats, resident and visiting yachts also cruise through the waters of the Management Area.



Figure 31. Boats secure to each other at the popular dive site Blue Corner. Photo courtesy of PCS.

The growing number of boats and type of boating activities has raised concerns over the environmental impact these activities are having on the wildlife and the delicate marine systems within the Management Area. This includes the increased risk of boats colliding with and fatally injuring endangered species such as dugongs and turtles as more boats travel at high speeds over critical habitat areas. The wash created by boats in high traffic areas is believed to be contributing to increased coastal erosion and subsequent degradation of near-shore habitats. Pollution of delicate marine systems from oil and gasoline used by 2-stroke engines as well as accidental spills is also a concern.

Ship groundings have the potential to cause significant loss and damage of coral reef habitat. Several groundings have already occurred within the Management Area, destroying small sections of valuable coral reef, including a popular dive-site. Although ship owners are required to compensate the State for damage to the reef, it is difficult to accurately assess the monetary value of a particular reef. Assessment needs to include not only the economic value of the reef, but also its ecological and cultural value as well as the cost of site restoration.

The safety of boating activities within the Management Area is a growing concern as boat traffic and



Figure 32. Boats anchored at Babelomekang Island.

the types of boats used continues to increase. The potential for boats colliding with people in the water and with other boats is a serious threat as people travel at high speed in heavily used areas. It is vital that strict safety standards are developed and adhered to ensure the continuation of safe boating activities within the Management Area particularly as marine based tourism activities are the lifeblood of Palau’s economy.

The following management actions aim to address these environmental and safety issues to ensure people can continue to enjoy safe and enjoyable boating activities within the Management Area.

BOATING MANAGEMENT ACTIONS

Objectives:

- ❖ Ensure safe and enjoyable boating activities that have minimal impact to marine and terrestrial ecosystems in the Management Area.
- ❖ Reduce the loss and degradation of coral reefs in the Management Area due to ship groundings and boat anchoring.

Review, modification and development of regulations

- Maintain existing regulations for motorboat registration.
- Define boat channels and/ or implement speed restrictions in areas that have high boat activity, are ecologically significant or sensitive to erosion.
- Develop and implement comprehensive water safety regulations for Koror State.
- Amend Koror State Public Law No. K6-121-2001 regarding the monetary value of damage to coral reef ecosystems located in Koror State's Waters, to include the use of settlement funds to cover legal costs and site restoration efforts (if required), and develop regulations to enforce the act.
- Develop a formal procedure to deal with ship groundings within the State (including legislation if necessary).
- Work with national and state agencies to establish a task force to deal with ship groundings (including PICRC, EQPB, AG, States).
- Develop a formal procedure to deal with oil spills within the State.

Enforcement of Laws and Regulations

- Undertake checks of boats during daily patrols to ensure compliance with boat licensing and safety requirements, including proper use of anchors.
- Maintain existing search and rescue procedures within the State.

Education and Awareness

- Develop and implement a program to increase awareness of boat regulations (safety requirements, speed restrictions) and reasons for their development.
- Increase awareness of environmental regulations applicable to boating.
- Develop a program to promote environmentally friendly boating practices.
- Develop a program to encourage boat operators to report any injured or dead turtles and dugongs they observe.

Research and Monitoring

- Work with national government to assess the value of the State's coral reef systems based on commercial, subsistence, cultural and environmental values.
- Strengthen the current reporting system and develop a database for turtle and dugong injuries and fatalities.

⇒ Corresponding notes

Incorporate previous regulations to establish no-wake zones in Koror. See Chapter 5 for description of areas.

As per Section 4.7 - Tourism and Recreation Actions.

The monetary value is based on the direct, indirect and non-use values of the damaged coral reef ecosystem. More accurate assessments are required (See Research Actions).

Based on SPREP guidelines.

Refer to SPREP guidelines.

Coordinate with EQPB.

Patrols are undertaken by Koror State Rangers.

The KS Rangers coordinate with national rescue agencies.

This is also covered in the Tour Guide Training Manual attached to this plan.

Benefits of 4-stroke engines, proper use of anchors, not spilling oil.

Coordinate with PCS. PCS has a reporting system in place.

The world bank initiated a project in 2003, coordinated by the ministry of finance.

Coordinate with PCS. PCS has a reporting system in place.

4.10 Control of Invasive Species and Species Outbreaks

DESCRIPTION OF MANAGEMENT ISSUE

Introduced and invasive species pose an imminent threat to the biological and economic value of the Management Area's resources. Although relatively few species have become established in the Management Area, invasive species have the potential to alter the natural structure and balance of the Area's marine and land ecosystem if they are not carefully controlled.

Species can take over and become invasive when they are introduced to an area where they do not usually occur and thus have no natural predators to control their numbers. They can also become invasive if they can utilize habitat or a food source that is not being used by a local species. Locally occurring species can also become invasive if their natural predators decrease, or there is a change in food availability due to external factors such as over-harvesting, or they are moved to a new location.



Figure 33. The introduced hydroid *Eudendrium carneum* (feathery growth on right of coral) grows on dead coral and other bare areas.

Although few of the damaging invasive plant species that have become established on land areas in Koror and other areas of Palau, occur on the Rock Islands, a few are present in localized areas. These include the coral bean tree (*Andenathera pavonina*), Leucaena (*Leucaena leucocephala*) and Siam weed (*Chromolaena odorata*). There is debate whether the coastal she-oak (*Casuarina* sp.) naturally occurs or was introduced to the Management Area. Irrespective of its source, it is an aggressive and hardy species that prevents native beach vegetation from becoming established and appears to be spreading to new areas via movement of its seeds by the wind. *Casuarina* is believed to be contributing to coastal erosion and thus degrading valuable nesting areas for Hawksbill and Green turtles, although this impact is minor compared to the other pressures on turtle nesting. The main impact that *casuarina* is likely to have is to lower the aesthetic value of tourist areas. Fortunately the fast growing mile-a-minute-vine (*Mikania micrantha*), which has been found on Koror and Peleliu, has not yet reached the Management Area. If it becomes established on the Rock Islands it could have devastating impacts, as it is very aggressive, can grow inside the forest canopy and choke native species (Invasive Species Committee, 2002). It is crucial that the Rock Islands are regularly monitored for *Mikania* and any plants removed quickly to stop its spread.

Several invasive animal species have already become established on the Rock Islands, including the sulphur-crested cockatoo (*Cacatua galerita*), eclectus parrot (*Eclectus roratus*), monitor lizard (*Varanus* sp.), Macaque monkey (*Macaca fascicularis*), Polynesian rat (*Rattus exulans*) and roof rat (*Rattus rattus*). Cockatoos are blamed for the disappearance of the endemic palm (*Gulubia palauensis*) from many of the Rock Islands, as they are believed to feed on the heart of the young palm. It is not clear what environmental impact parrots, lizards, monkeys and rats are having on the Rock Islands, but there are concerns that they could be impacting local bird populations by preying on bird eggs, damaging natural vegetation and carrying disease (particularly rats).

A few invasive marine species have been recorded in the Management Area, including a marine hydroid (*Eudendrium carneum*), the Nile Tilapia (*Oreochromis niloticus*), and an endemic marine anemone (*Aiptasia* sp) introduced to Jellyfish Lake. It is likely that more species have been introduced to the Management Area but have not yet been discovered. It is not known what impact the introduced hydroid is having on coral reefs within the Management Area. The hydroid was first observed in the channel between Koror and Babeldaob in 1998 and has since spread to reefs east of the channel and has been observed at Lighthouse Reef. There is concern that the hydroid could spread to popular dive sites within the Management Area. The highly invasive Nile Tilapia (*Oreochromis niloticus*) was found in freshwater ponds on Koror and an adjacent marine area in Malakal. It is unlikely to have a significant impact on the Management Area, as it prefers brackish waters, but a Tilapia Eradication Task-force was formed to eradicate this highly destructive species before it spreads to freshwater streams and rivers

on Babeldaob. Little is known about the newly observed anemone growing in Jellyfish Lake. Researchers are not sure when it was introduced to the lake and what ecological impact it is having.

Population explosions of the naturally occurring crown of thorns starfish (COTS), which feed on live coral, have caused damage to coral reefs in the Management Area. Although outbreaks are believed to be naturally occurring, they may be influenced by human activities such as over fishing or increased nutrient levels in the water (GBRMPA 97). COTS have exacerbated damage to coral reefs caused by bleaching events, by congregating on remaining areas of live coral. There have been some efforts to remove COTS from reef areas after bleaching events and during population explosions but the effectiveness and need for this approach has not been determined.

The following management actions are intended to address these issues and prevent the establishment of new invasive species.

CONTROL OF INVASIVE SPECIES ACTIONS

Objective:

- ❖ Prevent the establishment of new marine or terrestrial invasive species, and reduce the distribution and area covered by existing invasive species in the Management Area.

Review, modification and development of regulations

- Make it illegal to plant introduced ornamental/exotic species in the Management Area. Ensure that any new development projects plant only native species that already occur at the site
- Prohibit taking of domestic animals such as cats, dogs or monkeys to the Management Area

Enforcement of Rules and Regulations

- Work with national government/quarantine to ensure adequate inspection (for invasive species) of boats entering Koror State waters from other countries.
- Assist the Bureau of Agriculture and other agencies to eradicate the Nile Tilapia (*Oreochromis niloticus*) from Koror State.
- ❖ Continue to support efforts to remove COTS from selected reefs. Methods should incorporate the latest research findings, such as timing efforts before COTS spawn, and include a density “trigger” to initiate clean up efforts.
- ❖ Train the rangers and beach boys to identify and remove invasive terrestrial plant species, particularly from tourist areas and areas around summer houses.
- Continue rat control programs in the Rock Island Management to reduce rat populations.
- Remove invasive plant species from the Management Area and regularly re-visit areas to monitor for and remove new growth.
- Assess feasibility and need, and if necessary develop

⇒ Corresponding notes

Soil from other areas should not be brought in with seedlings, to prevent introduction of invasive species.

Based on decree by Ngaramaketii Chiefs Council 1973.

Species can be introduced by ballast water or attached to boat hulls.

The President of the ROP declared a quarantine emergency in December 2003. The Bureau of Agriculture was designated as the lead agency to coordinate eradication efforts. Local tour-operators have been instrumental in organizing clean up efforts. PICRC is currently investigating the life cycle of COTS in Palau.

PCC (Dr. Joel Miles) can provide training.

The program will be improved where possible, see research actions.

Consult the Bureau of Agriculture and National Invasive Weed Committee for best control methods. Enlist the help of community groups such as the Boy Scouts, Rotary. Work with National Taskforce of

control/eradication programs for introduced animals including monitor lizards, cockatoos, parrots, and monkeys in the Management Area.

- Employ hunters to regularly cull introduced cockatoo and parrot populations in the Management Area.

Education and awareness

- Support national efforts to increase awareness of invasive species.
- Develop educational and awareness material for tour-operators and tour-guides on marine and terrestrial invasive species and ask them to report any new or unusual species they observe.

Research and monitoring

- Develop a reporting system and response strategy for invasive species.
- Assess and regularly monitor the distribution and area covered by invasive plant species on the Rock Islands.
- Investigate new/alternate control methods for rat eradication and establish trials in the Management Area.
- Assess and regularly monitor the distribution and area covered by the introduced marine hydroid.
- Support research into the ecology of the introduced hydroid to determine its impact on Palau’s marine ecosystems.
- Support research into the distribution and ecology of the newly observed anemone- believed to be *Aiptasia* sp. in Ongeim’l Tketau (Jellyfish Lake).
- Initiate studies into the impacts and potential control measures for introduced animals including cockatoos, monitor lizards, parrots and monkeys in the Management Area.

Invasive Animal Species.

A Koror State Ranger should accompany hunters.

The National Invasive Weed Committee and Taskforce of Invasive Animal Species coordinate efforts.

Could target certain species, such as the newly introduced hydroid. KS could organize training or provide informational material.

The system will enable rangers, tour-guides etc. to report any new species or COTS outbreaks they observe.

Get assistance from the BoA and National Invasive Species Committee.

Work with Bureau of Agriculture division of Forestry.

Work with CRRF, Bureau of Marine Resources and PICRC.

Does anything eat the hydroid locally? Is the hydroid out-competing local species?

This anemone has not previously been seen in the lake before, although it is likely found in Palau. Work with CRRF.



Figure 34. Koror State Rangers and volunteers remove crown of thorns starfish from the reef. Photos courtesy of PCS.

Chapter 5. Rock Islands-Southern Lagoon Area Zoning

This section outlines the rationale and criteria used for zoning the Rock Islands-Southern Lagoon Area and explains the basic management guidelines to be employed in each zone. Modifications can be made to the zones if necessary, or the guidelines for each zone, as required by further information gathered from research and monitoring programs.

5.1 Rationale for Zoning

The zoning plan for the Rock Islands-Southern Lagoon Area builds on the existing state zoning map that designates the Rock Islands as a conservation (CD) zone. The "Rock Islands" refers to all islands, including land and beach areas within the State of Koror except Malakal, Ngerkebesang, Ngerur Island, Koror Mainland and any other small islets or islands joined to Malakal, Ngerkebesang or Koror Mainland by causeway or bridge. The zoning plan for the Management Area includes all marine areas in Koror State as well as the Rock Islands and designates more specific zones within the broader CD zone. It is based on the idea that although various activities and management regimes are appropriate within the Management Area, some of those activities and management regimes are more appropriate in certain areas than they are in other areas.

The zoning therefore allocates specified activities, facilities, and management actions to certain defined areas of the Management Area based on an analysis of the following criteria:

- i) Some biophysical features/elements are more sensitive than others. Thus the protection of different conservation values requires the application of different management approaches, if those values are to be maintained or enhanced.
- ii) Certain activities, while acceptable individually, are mutually incompatible or cause cumulative effects. They are therefore best confined to distinctly different areas.
- iii) Even where uses are compatible, designation of a zone helps to establish the management priorities for that particular area. For example, in one zone, protection of wildlife and vegetation may be paramount while in another zone, provision of a high quality visitor experience may be the main priority.
- iv) It is desirable to concentrate facility development in certain relatively small and clearly defined areas, both to minimize the area of environmental disturbance, and to minimize the costs of provision of services, such as toilets, rubbish bins, picnic facilities etc.

In the Rock Islands - Southern Lagoon Area the activities that require the greatest level of management attention are resource harvesting and tourism. The zoning system will allow harvesting over most of the Management Area but exclude it from specific smaller areas where it would conflict with other management objectives, for example where there are particularly sensitive conservation values, and where harvesting activities could be expected to significantly reduce the quality of the experience enjoyed by visitors.

5.2 The Zones

Six zone categories were created for the Rock Islands - Southern Lagoon Area. These are shown on Figure 21 and are described in detail below. There are several management restrictions applicable to all zones within the Management Area, which are shown in Table 8. The main activities permitted in each zone are summarized in Table 9.

Table 8: Management Restrictions Applicable to All Zones

- Prohibition of any new mining and dredging activities,
- No entry to foreign commercial fishing vessels and other large vessels such as large luxury boats, commercial cruise liners, cargo & military ships (excluding registered live aboard boats), except in designated channels/routes,
- No entry by foreign yachts and boats, except in designated channels/routes, without a cruising permit from Koror State,
- Harvesting restrictions (seasons, size limits & methods) designated in National and State Laws,
- No removal of cultural and historical artifacts (protected by national monument legislation),
- No damage allowed to any portion of the coral reef ecosystem (eg. via anchoring, resource harvesting or ship grounding),
- No harvest of timber, except for cultural purposes with permit from Koror State,
- Dumping of trash is prohibited; all litter must be removed from land and marine areas,
- Use of personal water craft (jet skis) is restricted to designated watersport zones,
- Tourists require a valid Rock Island Permit to undertake recreational activities in any zone,
- Only approved structures/facilities in support of flood and erosion prevention, conservation activities, and visitor use as defined in the Koror State "CD" conservation zone can be built on the Rock Islands, and
- No domestic animals (cats, dogs, monkeys) may be brought to the rock islands at any time.

Table 9. Summary of the main zoning activities in the Management Area.

	General Use Zone	Subsistence/ recreational fishery Zone	Tourism Zone	Conservation Zone	Preservation Zone	Special Management Areas
Main Activities						
Entry to marine areas	yes ^a	yes ^a	yes ^a	yes ^a	no	no ^g
Entry to land areas	yes ^b	yes ^b	yes ^a	yes ^b	no	no ^g
Boating/kayaking	yes	yes	yes	yes	no	no
Subsistence/recreational harvesting	yes ^c	yes ^c	no	no	no	no
Commercial harvest	yes ^d	no	no	no	no	no
SCUBA diving	yes	yes	yes	yes ^f	no	no
Snorkeling	yes	yes	yes	yes ^f	no	no
Personal Watercraft Use (jetskiis etc.)	no	no	yes ^e	no	no	no
Monitoring/research activities	yes ^h	yes ^h	yes ^h	yes ^h	yes ^h	yes ^h
a Tourists require a valid Rock Island Permit b Entry is restricted to Palau residents only c Non-Palau citizens require a non-commercial fishing licence d A commercial fishing licence is required e In designated water sport zones only f Tourists must be accompanied by certified tour-guide g Entry by approved operational staff or on-duty state or national enforcement staff h With permit from both Koror State and National Government						



Figure 35. Location of designated zones within the Management Area.

5.2.1 General Use Zone

The purpose of this zone is to enable the sustainable use of the Management Area and enable unrestricted access for all Palau residents, and restricted access for visitors holding Rock Island Permits.

Permitted Activities:

- √ unrestricted entry (day and overnight) to all marine and land areas by Palau residents.
- √ unrestricted entry to all marine areas by tourists holding Rock Island Use Permit.
- √ recreational and subsistence harvesting by Palau Citizens.
- √ recreational harvesting with permit by non-Palau citizens.
- √ commercial harvesting by Palau citizens only with valid commercial fishing permit.
- √ all marine based recreational activities except use of personal water craft (jet skis).
- √ research and monitoring activities with KS permit only.
- √ anchoring using a sand anchor only in sandy areas that does not damage the marine environment.
- √ overnight and extended stays on the Rock Islands by all Palau residents.
- √ lighting fires for cooking

Permitted Facilities/Infrastructure:

- √ approved structures/facilities in support of flood and erosion prevention, conservation activities, visitor use as per Koror State "CD" conservation zone.
- √ signs intended for visitor orientation, safety, and resource protection purposes
- √ approved latrines

Prohibited Activities:

- X general restrictions shown in Table 8
- X entry to land areas by tourists.
- X use of reef anchors (hook style)

Prohibited Facilities/Infrastructure:

- X any non-approved structures and facilities

Designated Areas within this Zone:

- ◆ all land areas not included in other zones.
- ◆ all marine areas not included in other zones.

Other sites may be designated based on the results of biophysical inventory work or cultural inventory studies. Such sites could include sensitive cultural sites, areas containing rare or endangered plants, and sites of importance to rare and endangered animals, either seasonally or year-round.

5.2.2 Subsistence/recreational fishery zone

The function of this zone is to enable sustainable subsistence and recreational harvesting adjacent to conservation and wildlife preservation zones. No commercial harvesting is permitted and restrictions are placed on recreational and subsistence harvesting methods and times.

Permitted Activities:

- √ unrestricted entry (day and night) by Palau residents
- √ unrestricted entry to all marine areas by tourists with valid Rock Island Use Permits
- √ recreational and subsistence harvesting by Palau Citizens subject to the restrictions shown below.

- √ recreational harvesting by Palau residents with valid fishing license subject to the restrictions shown below
- √ catch and release fishing for tourists holding valid fishing license
- √ research and monitoring activities with KS permit only.
- √ all marine based recreational activities except uses of personal water craft (jet skis)
- √ anchoring using a sand anchor only in sandy areas that does not damage the marine environment

Permitted Facilities/Infrastructure:

- √ signs intended for visitor orientation, safety, and resource protection purposes

Prohibited Activities:

- X general restrictions shown in Table 8
- X commercial harvesting
- X use of reef anchors (hook style)

Prohibited Facilities/Infrastructure:

- X any structures and facilities

Designated Areas within this Zone:

- ◆ Between Ngemelis Island Complex and Ngerukuid Islands and Kmekumer Islands.
- ◆ Malakal Harbor
- ◆ Coral reef and seagrass area SW of Ngederrak.
- ◆ Nikko Bay and adjacent channel

Other sites may be designated based on the results of biophysical inventory work. Such sites could include sensitive cultural sites, areas containing rare or endangered plants, and sites of importance to rare and endangered animals, either seasonally or year-round

5.2.3 *Tourist activity zone*

Low impact ecologically friendly tourism activities are the priority activity in this zone and management actions are aimed at conserving the high biological and cultural value of these sites. All marine and terrestrial flora and fauna are protected within these zones and no harvesting is permitted. Due to safety and congestion concerns conflicting activities have been separated into different activity zones displayed in Figure 21. These include Dive/snorkel zones, Snorkel Zones and Personal watercraft zones. In addition, some specific sites have been identified as requiring additional management attention.

Permitted Activities:

- √ entry to all land and marine areas by Palau residents.
- √ entry to all land and marine areas by tourists with valid Rock Island Use Permit
- √ recreational activities except where zoned otherwise (specific activity zones).
- √ camping permitted in established camping areas only
- √ fires in designated barbeque areas only
- √ collection of plants/herbs for traditional purposes (medicinal, food, handicraft - but no harvest of timber)
- √ collection of plants for human consumption (coconuts, other planted food trees)
- √ collection/ removal of invasive/introduced plants
- √ hunting/ removal of invasive/introduced animal species from land areas (rats, monkeys)
- √ collection/removal of invasive/introduced marine plants and animals
- √ research and monitoring activities with KS permit only
- √ mooring to designated mooring buoys
- √ anchoring using a sand anchor only in sandy areas that does not damage the marine environment, adjacent to tourist activity areas

Permitted Facilities/Infrastructure:

- √ signs intended for resource protection purposes and designating zoning
- √ approved structures/facilities in support of flood and erosion prevention, conservation activities, visitor use as per Koror State "CD" conservation zone

Prohibited Activities:

- X general restrictions shown in Table 8
- X killing, trapping, capture, wounding, taking of any fauna, including shellfish (except removal of introduced species or for approved research purposes)
- X taking of any flora (except for traditional use, removal of introduced species, or research purposes - with permit)
- X disturbance of nesting turtles, turtle nest, or removal of eggs
- X collection of bird eggs
- X boat crossing
- X anchoring use a reef anchor (hook style)

Prohibited Facilities/Infrastructure:

- X non-approved facilities/structures

Designated Areas within this Zone:

Marine Areas

- ◆ Ngemelis Island Reef
- ◆ all dive/snorkel sites demarcated with a mooring buoy (includes wrecks)
- ◆ Soft Coral Arch
- ◆ Cemetery Reef
- ◆ Ngerkebesang Conservation Zone
- ◆ Ongeim'l Tketau (Jellyfish lake) on Mecherechar Island
- ◆ Mandarin Fish Lake
- ◆ Clam city
- ◆ Sand flats, seagrass beds and coral reef areas adjacent to designated tourist beaches.

Land Areas

- ◆ Babelomekang Island and beaches
- ◆ Ioulomekang Island and beaches
- ◆ Ngchelobel beach area
- ◆ Ngeanges Island and beaches
- ◆ Ngeremeaus Island and beaches
- ◆ Ngchus Island and beaches
- ◆ Ngeremdiu and the Ngeremdiu Todai Trail (German Lighthouse)
- ◆ Ulong Islands and beaches
- ◆ Ngereblobang
- ◆ Bkul chotuut beach
- ◆ Ngkesill Island Beach

Other sites may be designated based on the results of biophysical inventory work or cultural inventory studies. Such sites could include sensitive cultural sites, areas containing rare or endangered plants, and sites of importance to rare and endangered animals, either seasonally or year-round.

5.2.3.1 *Specified activity zones*

Within the tourist zone, conflicting activities have been separated into specific zones. These are outlined below.

a) *Dive/Snorkel Zone*

General Restrictions

- general restrictions shown in Table 8 and above (section 5.2.3)
- tourists must be accompanied by a certified dive/snorkel guide only
- the in-water ratio for dive guide to divers should be no greater than 1:10
- the in-water ratio for snorkeling guide to snorkelers should be no greater than 1:10
- up to 10 advanced snorkelers plus guide/s may be in the water at any one time (in addition to divers)
- up to 5 boats can be moored to a mooring at any one time
- boats must use designated moorings and not follow snorkelers or divers except at completion of dive/snorkel

Permitted Activities:

- √ SCUBA diving
- √ snorkeling by advanced snorkelers only (confident swimmers who do not require a life jacket or flotation device, are comfortable in the water and can use mask and snorkel)
- √ collection and removal of any invasive/introduced plants and animals with KS approval
- √ research and monitoring activities with KS permit only
- √ mooring to designated mooring buoys by boats 29 foot or less
- √ motorboat travel at slow speed (no-wake) at all times within 100m of the reef

Permitted Facilities/Infrastructure:

- √ signs intended for resource protection purposes and designating zoning

Prohibited Activities:

- X general restrictions shown in Table 8 above (section 5.2.5).
- X snorkeling by novice snorkelers (not confident swimmers who require a flotation device and/or are not comfortable with mask and snorkel).
- X operation of any motorboat between or through the Ngemelis Islands Complex (Dmasech, Iilblau, Cheleu, Bailechesengel Islands), except for emergency purposes, research and monitoring, or law enforcement.
- X entry to any beach or land area in the Ngemelis Islands Complex (Dmasech, Iilblau, Cheleu, Bailechesengel Islands), except in emergency or with permission from the Ibedul or Koror State.
- X use of gloves by recreational divers or snorkelers
- X anchoring except in emergency

Prohibited Facilities/Infrastructure:

- X non-approved facilities/structures

Designated Areas within this Zone:

- ◆ All dive sites within Ngemelis Reef, including German Channel, except sites designated specifically for snorkelling.
- ◆ Siaes Corner
- ◆ Siaes Tunnel
- ◆ Shark City
- ◆ Ngerechong (Ngerechong Outside)
- ◆ Lighthouse Channel dive sites (Lighthouse express, Buoy 6 wreck)
- ◆ Chuyo Maru wreck
- ◆ Iro Maru wreck
- ◆ Helmet wreck

b) Snorkel Zones

General Restrictions:

- general restrictions shown in Table 8 and above (section 5.2.5).
- tourists must be accompanied by a certified dive/snorkel guide.
- the in-water ratio for snorkeling guide to customers should be 1:10.
- no more than 5 groups of snorkelers can be in the water at any one time.
- boats must use designated moorings and not follow snorkelers or divers except at completion of dive/snorkel

Permitted Activities:

- √ snorkeling by all levels of snorkelers
- √ collection and removal of any invasive/introduced plants and animals with KS approval
- √ research and monitoring activities with KS permit only
- √ mooring to designated mooring buoys (no more than 5 boats can be moored at any one time)
- √ motorboat travel at slow speed (no-wake) at all times within 100m of the reef or snorkelers

Permitted Facilities/Infrastructure:

- √ signs intended for resource protection purposes and designating zoning

Prohibited Activities:

- X general restrictions shown in Table 8 above (section 5.2.3).
- X anchoring except in emergency

Prohibited Facilities/Infrastructure:

- X Non-approved facilities/structures

Designated Areas within this Zone

- ◆ Soft Coral Arch
- ◆ Cemetery Reef
- ◆ Rose Coral Garden
- ◆ Ngerechong Inside
- ◆ Palau Pacific Resort (Ngerkebesang)

c) Water Sport Zones

Personal Watercraft (PWC) must be operated within designated personal watercraft zones unless being operated at an idle speed or headed toward the nearest water sport zone or from one water sport zone to another, pursuant to Koror State Personal Watercraft Regulations K7-139-2003. PWC operation, even at idle speed, is prohibited among and within 100 meters of the Rock Islands and within any Rock Island bay and the State's commercial port area. Refer to the regulations for detailed restrictions.

General Restrictions

- general restrictions shown in Table 8 and above (section 5.2.3)
- general restrictions contained in Koror State Personal Watercraft Regulations

Permitted Activities

- √ PWC operation between 6am and 7 pm by individuals 13 years old or older and passengers 7 years or older (unless PWC is being operated by passenger's parent or legal guardian), wearing a Type 1, II or III personal flotation device

Permitted Facilities/Infrastructure:

- √ signs intended for resource protection purposes and designating zoning

Prohibited Activities

- X general restrictions shown in Table 8 and above (section 5.2.3)
- X use of PWC to chase or harass wildlife
- X use of PWC by more than one operator and one individual passenger simultaneously
- X use of PWC without safety equipment
- X use of PWC while under the influence of any drug or alcohol

- X other recreational activities (snorkeling, diving, kayaking etc.)

Prohibited Facilities/Infrastructure

- X Non-approved facilities/structures

Designated Areas within this Zone:

- Meyuns Old Skozyo Sea Plane Ramp
- T-dock West Ramp at Arkemais
- Station Harbor, the deep water lagoon at the northern end of the Llebuchel Channel
- Koror Side of the Renrak Waiting House (Koror side of KB bridge).

The Koror State Governor may designate additional areas if he determines necessary.

d) Special Use Tourism Areas

Due to the delicate nature and ecological significance of some tourist areas, specific guidelines have been developed to enable their continued use while preserving their ecological integrity.

General Restrictions:

- general restrictions shown in Table 8 and above (section 5.2.5)
- tourists must be accompanied by a certified dive/snorkel guide
- guides must familiarize their guests with the site specific guidelines before entering the area.
- the in-water ratio for tour guide to customers should be 1:10

Permitted Activities:

- √ activities permitted in site specific guidelines
- √ snorkeling in Jellyfish Lake
- √ snorkeling in Mandarin Fish Lake
- √ kayaking in Mandarin Fish Lake
- √ SCUBA diving in Mandarin Fish Lake

Permitted Facilities/Infrastructure

- √ signs intended for resource protection purposes and designating zoning
- √ approved structures/facilities in support of flood and erosion prevention, conservation activities, visitor use as per Koror State "CD" conservation zone

Prohibited Activities

- X general restrictions shown in Table 8 and above (section 5.2.5)
- X activities prohibited in site-specific guidelines
- X SCUBA diving in Jellyfish Lake (Ongeim'l ketau)
- X Taking live or dead flora and fauna into Jellyfish Lake

Prohibited Facilities/Infrastructure

- X non-approved facilities/structures

Designated Areas within this Zone

- ◆ Jellyfish Lake (Ongeim'l ketau)
- ◆ Mandarin Fish Lake

Other sites may be designated based on the results of biophysical inventory work. Such sites could include sensitive cultural sites, areas containing rare or endangered plants, and sites of importance to rare and endangered animals, either seasonally or year-round.

5.2.4 Preservation zone

In this zone, protection of biophysical and/or cultural heritage values is the primary consideration. No harvesting is permitted and access is prohibited. This zone makes up the smallest percentage of the Management Area.

Permitted Activities:

- √ entry by on-duty staff of the Koror State Department of Conservation and Law Enforcement and Division of Fish and Wildlife for routine patrols and maintenance
- √ research and monitoring activities with Koror State and national permit only
- √ entry to marine lakes (except Jellyfish Lake) with Koror State approval only
- √ collection/removal of invasive/introduced marine plants and animals by approved staff

Permitted Facilities/Infrastructure:

- √ signs intended for resource protection purposes and designating zoning

Prohibited Activities:

- X general restrictions shown in Table 7
- X entry other than by approved researchers and staff.
- X killing, trapping, capture, wounding, taking of any marine and terrestrial fauna (except introduced species or for permitted research purposes)
- X taking of any marine or terrestrial flora (except introduced species, or for research purposes)
- X anchoring

Prohibited Facilities/Infrastructure:

- X structures and facilities other than signs

Designated Areas within this Zone:

- ◆ Ngerukuid Islands
- ◆ Kmekumer Islands
- ◆ Ngkisaol (Inlet) Sardines Sanctuary (100 yards from area)
- ◆ Ngederrak Reef
- ◆ All marine lakes excluding Ongeim'l Tketau "Jellyfish lake". A marine lake is defined as "any body of water that is separated from the ocean by rocks, island, land barrier or which is cut off from the ocean at low tide even if there is a tunnel or cave which links another part of the marine lake to ocean waters", by Koror State Public Law K6-96-99.

Other sites may be designated based on the results of biophysical inventory work or cultural inventory studies. Such sites could include sensitive cultural sites, areas containing rare or endangered plants, and sites of importance to rare and endangered animals, either seasonally or year-round.

5.2.5 Conservation zones

In this zone, conservation of the Management Area's cultural and biological values is the main management priority. No harvesting of resources is permitted although areas are open for local recreation use, and tourism is permitted in marine areas, with a certified tour-guide only.

Permitted Activities:

Marine

- √ entry to marine areas by residents of Palau
- √ all recreational activities except personal water craft operation
- √ tourism activities in marine areas if accompanied by a certified tour-guide only
- √ research and monitoring activities with KS permit only
- √ collection/removal of invasive/introduced marine plants and animals with Koror State approval.
- √ mooring to designated mooring buoys only

Land based

- √ restricted access to Ngemelis Islands Complex (by permission from Koror State or Traditional Leaders) camping permitted in established camping areas only
- √ access to Euidelchol Island beaches during the day
- √ fires in designated barbeque areas only
- √ collection of terrestrial plants/herbs for traditional purposes (medicinal, food, handicraft)
- √ collection of plants for human consumption (coconuts, other planted food trees).
- √ collection/ removal of invasive/introduced plants with Koror State Approval.
- √ hunting/ removal of invasive/introduced animal species from land areas by designated hunters

Permitted Facilities/Infrastructure:

- √ signs intended for resource protection purposes and designating zoning
- √ approved structures/facilities in support of flood and erosion prevention, conservation activities, visitor use as per Koror State "CD" conservation zone

Prohibited Activities:

- X general restrictions shown in Table 8
- X killing, trapping, capture, wounding, taking of any fauna (except removal of introduced species or for permitted research purposes)
- X taking of any flora (except for approved traditional use, removal of introduced species, or research purposes- with permit).
- X No entry to Euidelchol Island beaches at night disturbance of nesting turtles, turtle nest, or removal of eggs
- X collection of bird eggs
- X operation of motor boat between Ngemelis Island complex except in emergency
- X anchoring (except in emergency)

Prohibited Facilities/Infrastructure:

- X Non-approved facilities/structures

Designated Areas within this Zone:

Marine areas:

- ◆ Ngerumekaol Spawning Area

Land areas

- ◆ Euidelchol Island beaches (turtle nesting area)
- ◆ Ngemelis Island Complex (Dmasech, lillblau, Cheleu, Bailechesengel), except Bkul chotuut beach on Bailechesengel Island

Other sites may be designated based on the results of biophysical inventory work or cultural inventory studies. Such sites could include sensitive cultural sites, areas containing rare or endangered plants, and sites of importance to rare and endangered animals, either seasonally or year-round.

5.2.6 Special management zones

This zone was created to enable the continuation of existing activities that are economically valuable to Koror State but need special attention because of their actual or potential impacts on the goals and objectives of this Management Plan. This includes the existing sand mining operation South of Ngederrak Reef and Dolphins Pacific Educational and Research facility in Malakal.

Permitted Activities:

- √ Sand mining operations in accordance with State permit requirements
- √ Operation of Dolphins Pacific educational and research facility in accordance with State permit requirements and EQPB regulations
- √ Monitoring for compliance with permit regulations
- √ Approved research activities with permit from Koror State

Permitted Facilities/Infrastructure:

- √ signs intended for daily operation, resource protection purposes and designating zoning
- √ approved operational facilities

Prohibited Activities:

- X entry other than by approved operational staff, on-duty State or national enforcement staff approved visitors
- X killing, trapping, capture, wounding, taking of any marine and terrestrial fauna (except introduced species or for research purposes)
- X taking of any marine or terrestrial flora (except introduced species, or for research purposes)

Prohibited Facilities/Infrastructure:

- X Non-approved structures other than signs

Designated Areas within this Zone:

- ◆ Sand mining lease south west of Taberrakl reef
- ◆ Dolphins Pacific facility opposite Malakal on Ngeruktabel

Chapter 6. Management Plan Implementation and Review

6.1 Current Administration and Coordination of the Management Area

The Traditional Leaders of Koror and the Koror State Government own and have jurisdiction over the entire Management Area. They have appointed the Koror State Public Lands Authority (KSPLA) and the Koror State Planning and Zoning Commission to oversee all land and designate land use and zoning, respectively. Both departments receive guidance from steering committees and a board consisting of both traditional leaders and legislators, to ensure balanced representation of all issues.



Figure 36. The staff of the Koror State Department of Conservation and Law Enforcement.

The Koror State Department of Conservation and Law Enforcement is responsible for day-to-day management and coordination of activities within the Management Area as well as enforcing all State laws.

The department was founded in 1994 and consists of trained, ranked and uniformed rangers that maintain law and order, as well as preserve the unique natural resources of the state. It also has a "Beach Boys Program", which is responsible for maintaining the tourist activity areas in the Management Area and a Coastal Resources Management Office, whose primary focus has been the development of this comprehensive Management Plan and which will lead its implementation.

The department currently has 27 staff; the Director, a coastal resources manager, rock island development officer, 2 administrative staff, 13 rangers and 9 beach boys. The staff are located in two offices, the ranger station at Malakal and coastal resources management office in the State Capital Building, with the director dividing his time between the two offices.

The State Government allocates at least 50% of the revenue generated from the sale of Rock Island Use Permits to fund the departments programs and activities within the Management Area. In addition the department also collaborates with a number of national and international agencies and organizations to build its capacity, attain additional funding sources, and strengthen community outreach, conservation and research initiatives in the Management Area. The department partners with local institutions including Palau Conservation Society (PCS), Palau International Coral Reef Center (PICRC), and Community Centered Conservation (C3). International partners include The Nature Conservancy (TNC), Coral Reef Research Foundation (CRRF) International Coral Reef Action Network (ICRAN), U.S. National Fish and Wildlife Service (NFWF) and CORAL (Coral Reef Alliance). As conservation and research programs continue to expand, the department will need to strengthen existing collaborations, develop new partnerships, and seek external funding sources to successfully implement its programs.



Figure 37. The "beach boys".

It is apparent that existing resources and staff numbers will need to be expanded in order to effectively implement the strategies and actions detailed in this plan. Without adequate resources and staffing, it will be difficult to effectively implement management strategies and actions, no matter how well designed they are. In addition, existing administrative and enforcement procedures need to be updated to ensure that existing resources are being effectively utilized and that staff can reach their full potential. These issues are addressed in the next section.

6.2 Financial, Staffing, & Administrative Needs

Objectives

- ❖ Raise resources and staff numbers within the Department of Conservation and Law Enforcement to the levels required to effectively implement conservation and enforcement programs in the Management Area.
- ❖ Increase the effectiveness of administration and enforcement procedures within the Department of Conservation and Law Enforcement.

Financial Management Actions

- Continue to fund departmental programs through state budget allocations.
- Continue to seek and apply for international grants to fund research and conservation projects within the Management Area.
- Prepare an annual work plan and budget linked to the Management Plan. This should also include staffing requirements.
- Continue to submit quarterly work progress and budget expenditure reports to ensure accountability.
- Annually review and assess permit fees based on annual budget requirements.
- Prepare an annual report on number of tourists entering Palau, number of rock island use permits and revenue raised.

Staffing Management Actions

- Review and amend the organizational structure of the Department of Conservation and Law Enforcement to include conservation and enforcement officers within the Rangers Program.
- Increase number of Rangers to enable 4 Conservation and 12 Law Enforcement Officers.
- Adopt the Koror State Rangers Compliance Program and annually review and update the program.
- Develop a more detailed ranger compliance program that includes staff numbers, roles, training needs, and staff annual review performance.
- Develop handbooks for the coastal resource management and beach boys program, which includes staff numbers, roles, administrative procedures, training needs, and staff annual review performance.
- Make the 'coastal management officer' a permanent position within the Department of Conservation & Law Enforcement. This will enable the State to effectively coordinate and lead monitoring programs
- Continue to work with local and international organizations and agencies to build the department's capacity, and strengthen community outreach, conservation and research initiatives in the Management Area.
- Continue to strengthen staff capacity by regularly enrolling staff in local and off-island training programs.

⇒ Corresponding notes

Funds are raised through the sale of Rock Island Use Permits. See table 10 for budget projections. Ensure that all sources of funds and expenditures are clearly accountable. See table 10 for budget projections.

Departmental work plans and budgets are submitted to the Koror State Governor annually in October. Reports are submitted to the Koror State Governor.

Fee increases may be needed to fund additional staff and expand programs. The Palau Visitors Authority publishes monthly visitor statistics.

Refer to Figure 23 for the proposed organizational structure.

See table 10 for projected staff requirements.

See attachments for a copy of the Koror State Rangers compliance program.

This is linked to the Management Plan and reviewed annually. Training needs include conservation issues, law enforcement & dive safety. Handbooks will be in the same format as the Ranger Compliance Program and linked to the Management Plan, with annual review.

The officer must have a marine science background and be able to coordinate and lead monitoring programs, and provide technical assistance to the director.

Financial assistance is often available from the training agency.

Administration Actions

- Maintain the existing administration of the Management Area.
- Maintain existing State procedure to resolve conflicts between departments.
- Prepare an annual report on monitoring and research activities, linked to the Management Plan.
- Prepare an annual report on education and awareness programs, linked to the Management Plan.
- Review and amend the existing permitting process for research activities within the Management Area.

- Protect important research areas through inclusion in conservation or protection zones wherever possible. Priority should be given to long-term research areas that are ecologically significant such as coral spawning sites.
- Conduct regular patrols to enforce conservation areas with research sites and ensure that researchers have relevant permits.
- Increase awareness of research permits requirements for Koror State.

- Develop informational material to distribute with research permits.
- Review permitting process for professional photography (still and film) for professional photographers who are not permanent residents of Koror State, and make changes as necessary.

- Increase awareness within the tourism industry of professional photography permit requirements.

Refer to Table 11 below.

Unresolved disputes are settled by legal proceedings.

This should include management implications & recommendations.

This should include management implications & recommendations.

This should include a more extensive research application form, standardized review process & permit fee, and reporting system.

Study sites can be unintentionally damaged or disturbed by visitors.

Ensure all local research organizations are aware of State permit requirements and insure that visiting researchers have permits.

Need to assess relevance to still photography and review application process to include brief description of projects (for films specifically).

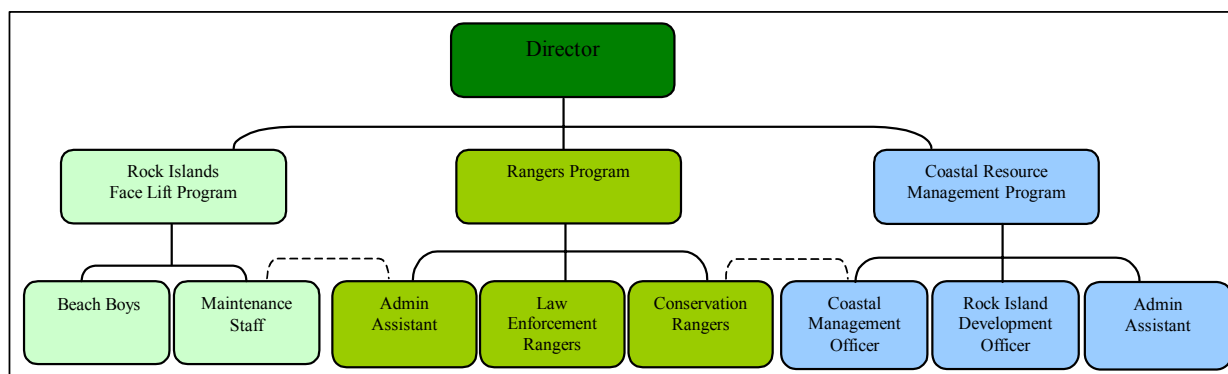


Figure 38. The proposed organizational structure for the Department of Conservation and Law Enforcement includes conservation and law enforcement rangers. Dotted line represents a close working relationship between staff.

Table 10. Projected staff and funding required for implementing management activities outlined in this plan.

Staffing		Current	Projected			
Program	Position	2004	2005	2006	2007	2008
Management	Director	1	1	1	1	1
	Secretary	1	1	1	1	1
	Coastal Resources Management Officer	1	1	1	1	1
	Rock Islands Support Officer	1	1	1	1	1
	Office assistant	1	1	1	1	1
Rangers	Rangers (law enforcement)	13	14	14	15	15
	Rangers (conservation)	0	4	4	5	5
RI face lift	Beach Boys	9	10	10	11	11
Security	Security Guards	2	2	2	2	2
Total staff numbers		29	35	35	38	38

Budget Item	Program	2004	2005	2006	2007	2008
Personel costs (excluding inflation)	Management Staff	\$73,600	\$73,600	\$73,600	\$73,600	\$73,600
	Rangers Program	\$125,500	\$165,500	\$165,500	\$173,500	\$173,500
	Rock Islands Face Lift Program	\$52,300	\$57,300	\$57,300	\$62,300	\$62,300
	Security	\$18,200	\$18,200	\$18,200	\$18,200	\$18,200
Total personel costs		\$269,600	\$314,600	\$314,600	\$327,600	\$327,600
Operation costs	Department	\$102,000	\$160,000	\$110,000	\$115,000	\$165,000
Total costs		\$371,600	\$474,600	\$424,600	\$442,600	\$492,600
Project Activities (non-department funding)	Other State government funds	\$38,000	\$38,000	\$38,000	\$38,000	\$38,000
	Externally funded projects (grants)	\$73,500	\$70,000	\$70,000	\$70,000	\$70,000
	Partnerships (in-kind support)	\$60,000	\$60,000	\$60,000	\$60,000	\$60,000
Total costs		\$543,100	\$642,600	\$592,600	\$610,600	\$660,600

NB: Staff numbers and expenses are approximations only and do not include inflation costs.

Operation costs include the cost of new boat engines every 3 years (2005, 2008).

Other government programs include: coastal management, rat eradication, picnic huts/ bio toilets

Table 11. Authority within the Management Area	
Management Issue	Responsible Koror State Department
Land ownership	Public Lands Authority
Land use and zoning	Zoning & Planning Commission
Resource management	Conservation & Law Enforcement
Historic and cultural preservation	Community, Cultural & Youth Affairs

6.3 Review of the Management Plan

The Management Plan will be reviewed and updated yearly by a steering committee appointed by the Governor. It is recommended that the steering committee be based on the existing Rock Island Management Area Task Force, to ensure balanced representation on all management issues. The Steering committee will work the Koror State Government to implement the Management Plan over the next 5 years. The Department of Conservation and Law Enforcement will serve as the secretariat for the steering committee and convene regular meetings.

It is recommended that the Steering Committee review the Management Plan 6 months after it has been adopted and implemented to assess its feasibility and constraints. A thorough review should then be conducted after 12 months and annually for the following 4 years.

The thorough review should include an assessment of the effectiveness of the management actions contained in the Management Plan, incorporate recommendations from monitoring and education and awareness program annual reports, as well as the latest research findings and management recommendations. In addition, stakeholders should be given an opportunity to submit comments on management activities.

The effectiveness of management actions will be measured using the indicators described in Volume II of the Management Plan: Action Plan and Monitoring Program. Management Actions will then be reviewed and updated as necessary.



Figure 39. An example of the many activities undertaken by the staff of the Koror State Department of Conservation & Law Enforcement.

Acknowledgements

We would like to acknowledge and thank the following people for their roles in preparing the plan.

- ❖ The traditional owners of the Management Area - the Traditional Leadership of Koror - for always taking responsibility of the Area and having the insight to initiate the planning process.
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- ❖ The many people from the community, tourism industry, fishers, and State and National Government Agencies who shared their thoughts and ideas about the Management Area, and patiently answered our questions.



The RIMA executive committee touring the Management Area.

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The Management Plan was completed by the Koror State Department of Conservation and Law Enforcement, with assistance from The Nature Conservancy.

The planning team included:

- Dr. Katherine Chaston**, Coastal Management Officer - stakeholder consultations, plan development, report photographs, report author,
- Ilebrang Olkeriil**, Rock Islands Development Officer - stakeholder consultations, development of maps and plan,
- Charlene Mersai**, previous Coastal Management Officer - stakeholder consultations, literature compilation,
- Robin Pelc**, Volunteer - stakeholder consultations, conservation area planning analysis, plan development,
- Adalbert Eledui**, Director - stakeholder consultations, plan development, and
- David Hinchley**, Palau Program Director TNC - technical advice, plan development, report editing.

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Supporting Documents

List of Plant and Animal Species mentioned in the Management Plan

Marine Animals

Palauan Name	Common Name	Scientific Name
	Vertebrates	Phylum Chordata
Chedeng	Sharks	Class Chondrichthyes
Besachel	Silvertip Shark	<i>Carcharhinus albimarginatus</i>
Mederart, Teongt	Grey Reef Shark	<i>Carcharhinus amblyrhynchos</i>
Matukeoll	Reef blacktip Shark	<i>Carcharhinus melanopterus</i>
Mochelas	Tiger Shark	<i>Galeocerdo cuvier</i>
Metal	Lemon Shark	<i>Negaprion acutidens</i>
Ulupsuchel	Reef whitetip shark	<i>Triaenodon obesus</i>
Ulach	Scalloped hammerhead shark	<i>Sphyrna lewini</i>
Biall	Zebra Shark	<i>Stegastoma varium</i>
	Bony fish	Class Osteichthyhes
Teber	Hardyhead silverside	<i>Atherinomorus lacunosus</i>
Berdebed or Kemedukl	Humphead Parrotfish	<i>Bolbometopon muricatum</i>
Ngimr; maml	Humphead Wrasse	<i>Chelinus undulatus</i>
Maml	Humphead or Napoleon Wrasse	<i>Chelinus undulatus</i>
Ksau' temekai	Camouflage grouper	<i>Epinephelus polyphkadion</i>
Meteungerel' temekai	Brown marbled grouper	<i>Epinephelus fuscoguttatus</i>
Mekebud	Gold-spot herring	<i>Herklotsichthys quadrimaculatus</i>
Kedesau	Red snapper	<i>Lutjanus bohar.</i>
Keremlal	Humpback snapper	<i>Lutjanus gibbus</i>
Itotech	Blackspot emperor	<i>Lethrinus harak</i>
Mechur	Yellowlip emperor	<i>Lethrinus xanthurus</i>
Cherangel	Orange spine unicorn fish	<i>Naso lituratus</i>
Chum	Blue spine unicorn fish	<i>Naso unicornis</i>
	Nile Tilapia	<i>Oreochromis niloticus</i>
Tiau	Leopard coral grouper	<i>Plectropomus leopardus</i>
Mokas	Black saddled or giant coral grouper	<i>Plectropomus laevis</i>
Katuu'tiau	Black saddled or giant coral grouper	<i>Plectropomus laevis</i>
Meyas	Seagrass rabbitfish	<i>Siganus canaliculatus</i>
Merau	Blue sprat	<i>Spratelloides delicatulus</i>

	Mammals	Class Mammalia
Mesekiu	Dugong	<i>Dugong dugon</i>
	Reptiles	Class Reptilia
	Turtles	Family Cheloniidae
Melob	Green Turtle	<i>Chelonia mydas</i>
Ngas	Hawksbill Turtle	<i>Eretmochelys imbricata</i>
		Family Crocodylidae
Ius	Crocodiles	<i>Crocodylus porosus</i>
	Crabs & lobsters	Phylum Arthropoda
Ketat	Coconut crab	<i>Birgus latro</i>
Rekung el daob	Land crab	<i>Cardisoma carnifex</i>
Rekung el beab	Land crab	<i>Discoplax hirtipes</i>
Kesuar	Land crab	<i>Gecarcoidea lalandii</i>
Melech	Painted Reef Lobster	<i>Panulirus longipes femoristriga</i>
Raikilius	Spiny lobster	<i>Panulirus penicillatus</i>
Bleached	Rock lobster	<i>Panulirus versicolor</i>
Emang	Mangrove crab	<i>Scylla serrata</i>
		Phylum Mollusca
	<i>Clams and oysters</i>	Class Bivalves
Duadeb	Giant clam	<i>Hippopus hippopus</i>
Duadeb	Giant clam	<i>Hippopus porcellanus</i>
Chesiuch	Blacklip Pearl Oyster	<i>Pinctada margaritifera</i>
Oruer	Giant clam	<i>Tridacna crocea</i>
Kism	Giant clam	<i>Tridacna derasa</i>
Oktang	Giant clam	<i>Tridacna gigas</i>
Melibes	Giant clam	<i>Tridacna maxima</i>
Ribkungel	Giant Clam	<i>Tridacna squamosa</i>
	Gastropods (snails)	Class Gastropoda
Kedarm	Nautilus	<i>Nautilus belauensis</i>
Sumum	Trochus	<i>Trochus niloticus</i>
	Starfish, sea urchins, sea cucumbers	Phylum Echinodermata
		Class Echinoidea
Ibuchel	Sea urchin	<i>Tripneustes gratilla</i>
		Class Holothuroidea
Badelchelid	Sea cucumber	<i>Actinopyga mauritiana</i>

Eremrum	Sea cucumber	<i>Actinopyga miliaris</i>
Bakelungal cherou	Sea cucumber	<i>Hothothuria fuscogilva</i>
Bakelungal chedelkelek	Sea cucumber	<i>Holithuria nobilis</i>
Molech	Sea cucumber	<i>Holothuria scabra</i>
Temetamel	Sea cucumber	<i>Thelenota ananas</i>
		<i>Class Stelleroidea</i>
Rusech	Crown of thorns starfish	<i>Acanthaster planci</i>
Btuch ra daob	Starfish	<i>Asteroidea</i> sp.
	Corals & Jellyfish	Phylum cnidaria
	Marine hydroid	<i>Eudendrium carneum</i>
Chedead	Mastigias jellyfish	<i>Mastigias</i> sp.
	Black coral	<i>Anithpathes</i> sp.

Terrestrial Animals

Palauan Name	Common Name	Scientific Name
	Vertebrates	Phylum Chordata
	Frogs, toads	Class Amphibia
	Toad	<i>Bufo marinus</i>
	Birds	Class Aves
Iakkotsiang	Greater sulphur-crested cockatoo	<i>Cacatua galerita</i>
Laib	Nicobar pigeon	<i>Caloenas nicobarica</i>
Belochel	Micronesian pigeon	<i>Ducula oceanica</i>
Sechou	Pacific Reef-Heron	<i>Egretta sacra</i>
Iakkotsiang	Electus parrot	<i>Electus roratus</i>
Omekrengukl	Palau ground dove	<i>Gallicolumba canifrons</i>
Bekai	Micronesian megapode	<i>Megapodius laperouse</i>
Ochaieu	Audubon shearwater	<i>Puffinus lherminieri</i>
Chesuch	Palau owl	<i>Pyrrhoglaux podargina</i>
	Bridled tern	<i>Sterna anaethetus</i>
Kerkirs	Black-naped tern	<i>Sterna sumatrana</i>
	Mammals	Class Mammalia
Chesisualik	Pacific Sheathtailed Bat	<i>Emballonura semicaudata</i>
	Macaque monkey	<i>Macaca fascicularis</i>
Beab	Polynesian rat	<i>Rattus exulans</i>
Beab	Roof rat	<i>Rattus rattus</i>

Beab	House mouse	<i>Mus musculus</i>
Olik	Palau fruit bat	<i>Pteropus pilosis</i>
Olik	Marianas Fruit Bat	<i>Pteropus mariannus pelewensis</i>
	Reptiles	Class Reptilia
Chelub	Monitor Lizard	<i>Varanus. sp</i>

Marine Plants

Palauan Name	Common Name	Scientific Name
	Mangroves	
	Seagrass	

Terrestrial Plants

Palauan Name	Common Name	Scientific Name
	Trees/shrubs	
Telengtu'ngd, telentundalel	Coral bean tree	<i>Andenathera pavonina*</i>
Ngas	Ironwood	<i>Casuarina equisetifolia</i>
Lius	Coconut tree	<i>Cocos nucifera</i>
Ebouch	Rock Island palm	<i>Gulubia palauensis</i>
Telengtungd	Leucaena	<i>Leucaena sp.*</i>
	Vines/herbs	
Ngensgesil	Siam-weed	<i>Chromolaena odorata*</i>
Teb el yas	Mile-a-minute vine	<i>Mikania micrantha*</i>

* Introduced/ invasive species.



**Rock Islands -
Southern Lagoon Area
Management Plan
2004 — 2008**



**Volume 2
Action Plan &
Monitoring Program**

**Koror State Government
Republic of Palau**

May 2004

**Rock Islands Southern Lagoon Area
Management Plan
2004-2008**

**Volume 2
Action Plan & Monitoring Program**

Koror State Government
Republic of Palau

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FOREWORD

The Koror State Department of Conservation and Law Enforcement is responsible for day-to-day management and coordination of activities within the Management Area as well as enforcing all State laws. The department was founded in 1994 and consists of trained, ranked and uniformed rangers that maintain law and order, as well as preserve the unique natural resources of the state. It also has a "Rock Islands Facelift Program", which is responsible for maintaining the tourist activity areas in the Management Area and a Coastal Resources Management Office, whose primary focus has been the development of this comprehensive Management Plan and which will lead its implementation. The purpose of this management plan is to establish a comprehensive, coordinated management program for the Rock Islands-Southern Lagoon Area for the next 5 years.

Our department developed the management plan with assistance from The Nature Conservancy and Palau Conservation Society. The plan was developed over 2 years, using The Nature Conservancy's conservation area planning approach. The plan was reviewed and approved in June 2004, by a Task Force appointed by the Koror State Governor. The Task Force included representatives from the Governor's Office, House of Traditional Leaders, Koror State Legislature, Koror State Public Land Authority, Koror Planning and Zoning Commission, Koror Women's Group and the Ngarametal Association.

The management plan is divided into three volumes. Volume one is a brief, concise document that provides an overview of the management program without the specific details and can be read independently. Volume two is the Action Plan and Monitoring Program, it provides the details required to implement the plan such as timeline and manpower. Volume three is the Background and Analysis it provides the detailed background information and description of the methods used to make the actions.

This 5 year plan is an important first step in an on-going cycle of design, implementation and review, and should be viewed as a "working plan" rather than a static document. The plan will be reviewed, updated and modified yearly as more information becomes available and management strategies are tested for effectiveness.

The Koror State Department of Conservation and Law Enforcement will work closely with key stakeholders, and national and international resource agencies and organizations to implement the plan.

Sincerely,



Adalbert Eledui

Director, Koror State Dept. of Conservation and Law Enforcement

Approval Page

This plan has been reviewed and approved by the
Rock Island Management Area Executive Committee &
Governor John Gibbons

June 2004

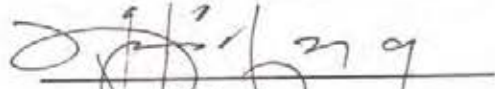
Governor John C. Gibbons



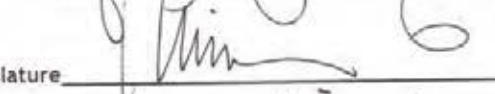
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Balio Ngiraidong, Special Assistant, House of Traditional Leaders



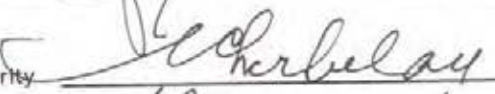
Millan Isack, Chairman Committee on Environment, Koror State Legislature



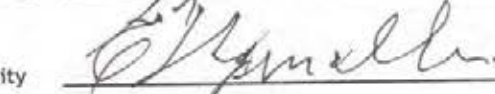
Eyos Rudimch, Chairman Committee on Tourism, Koror State Legislature



Viviana Ucherbelau, Board Member, Koror State Public Land Authority



Ermas Ngiraelbaed, Board Member, Koror State Public Land Authority



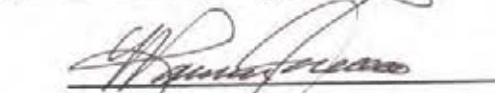
Tutoud Ngiralmu, Vice Chairman, Koror State Planning & Zoning Commission



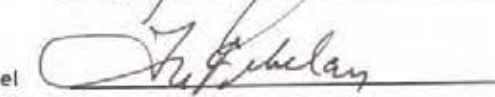
Sebastian Andreas, Board Member, Koror State Planning & Zoning Commission



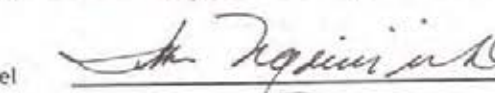
Roman Yano, Committee Chairman, Ngarametal Association



Florenca Elbelau, Koror Traditional Women's Group, Ngaramaiberel



Takeko Ngirairiki, Koror Traditional Women's Group, Ngaramaiberel



Adalbert Eledui, Director, Conservation & Law Enforcement



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List of Acronyms

BMR	Bureau of Marine Resources
BoA	Bureau of Agriculture
BPS	Bureau of Public Safety
BTA	Belau Tourism Association
C3	Community Centered Conservation
CMO	Coastal Management Officer
CORAL	Coral Reef Alliance
CR	Conservation Rangers
CRRF	Coral Reef Research Foundation
DFW	Division of Fish and Wildlife
EQPB	Environment Quality Protection Board
HOTL	House of Traditional Leaders
ICRAN	International Coral Reef Action Network
KS	Koror State
KSL	Koror State Legislature
KSPLA	Koror State Public Lands Authority
KSPW	Koror State Public Works
KSPZC	Koror State Public Zoning Commission
NFWF	U.S. National Fish and Wildlife Foundation
NOAA	National Oceanic and Atmospheric Administration
OERC	Office of Environment Response and Coordination
PCC	Palau Community College
PCS	Palau Conservation Society
PICRC	Palau International Coral Reef Centre
PVA	Palau Visitors Authority
RDO	Rock Island Development Officer
SMS	Social marketing Specialist
SPREP	South Pacific Regional Environment Program
TNC	The Nature Conservancy

Chapter 1. Action Plan

1.1 Background/ Purpose of the Action Plan

This Action Plan accompanies Volume I of the Rock Islands - Southern Lagoon Management Plan. It provides the detailed information required by Koror State to implement the management actions presented in Volume I and will assist staff with the development and implementation of annual department work plans.

1.2 Organization and Format

The Action Plan presents the management actions included in Volume 1, assigns priorities to those actions, and allocates those prioritized actions to time periods within a five year program. The Plan is organized into 5 tables that correspond to the groupings of management actions used in the Management Plan. These include:

1. Review, modification and development of regulations,
2. Enforcement of regulations,
3. Increasing education and awareness,
4. Research and monitoring, and
5. Direct management.

Each Management Action is assigned one of three levels of priority based on the urgency of the action as well as what role Koror State has in implementing it (supporting or main), The three levels are:

- H - High (undertaken in program year 1 or 2)
- M - Medium (undertaken in program year 2 or 3)
- L - Low (undertaken in program year 4 or 5)

The “**Program Year**” indicates the year or years in the Five Year Program to which the Management Action is assigned. Some Actions can be completed in a defined number of years. Other Actions are considered to be on going, and continue indefinitely from the year in which they are initiated.

A person/persons from Koror State is assigned as the “**responsible staff**” for each management action. This person is responsible for overseeing the implementation of the management action. They will work closely with the Director of the Department of Conservation and Law Enforcement, the Koror State Legislature, Koror State Governor, House of Traditional Leaders and other designated State or National agencies to implement the action.

“**Partners**” are other State and National Government Agencies, or Non-Government Organizations whose support and assistance is vital to the implementation of the management action.

1.3 Action Tables

Action tables follow on the next page.

Table 1. Review, Modification & Development of Regulations

Action	Responsible staff	Priority	2004	2005	2006	2007	2008	Partners	Comments
Harvest of Fish									
Maintain existing fishing regulations, conservation and no-take areas.	Director, KS lawyers	H	X	X	X	X	X	KS legislators, Governor	Review regulations yearly.
Maintain the ban on commercial fishing within the reef by foreign-owned fishing businesses and joint-commercial fishing ventures with foreign fishermen.	Director, KS Lawyers	H	X	X	X	X	X	KS legislators, Governor	
Lobby the national government to extend the closed season for grouper harvest by one month to August (new closed season would be from April to August).	Director, KSL, Governor	H		X				BMR, DFW, PICRC, PCS	Coordinate with research, monitoring & education programs
Give Ngederrak reef long-term protection, by designating a preservation zone, with no access to this area except for scientific research, monitoring and law enforcement.	Director, KS Lawyers	H	X					KS legislators, Governor, CRRF, PICRC, C3, PCS	Coordinate with research, monitoring & education programs
Establish subsistence/recreational zones for protection of critical fish habitat.	Director, CMO, KS lawyers	H	X					KS legislators, HOTL	Consult local communities.
Establish a permit system to restrict taking of live fish as breeding stock for aquaculture enterprises and for export.	CMO, KS lawyers	M		X				KS legislators, BMR,	Consult MAREPAC members.
Support national government efforts to review and update existing national harvesting laws for inshore fisheries.	Director	H		X				BMR, KS legislators	FAO working group is currently assisting the Republic.
Investigate spawning aggregations (other than Ngerumekaol) and establish fishing restrictions or other control measures if necessary to ensure their long-term survival.	CMO, KS lawyers	M		X	X			KS legislators, PICRC, PCS, C3, CRRF	Get support from local research & environment groups.
Harvest of Invertebrates									
Maintain existing fishing regulations, conservation and no-take areas.	Director, KS lawyers	H	X	X	X	X	X	KS Legislators, Governor	
Delete in its entirety Koror municipal ordinance No. 48-69 (effective June 16, 1969), which set aside 6 reefs as trochus breeding sanctuaries. This law is no longer enforced and the designated reef areas are not optimal.	Director, KS Lawyers	H	X					KS Legislators, Governor	
Establish a preservation zone at Kmekumer Islands, with no access to this area except for scientific research, monitoring and law enforcement	Director, KS Lawyers	H	X					Traditional Leaders, KS Legislators, Governor	
Give Ngederrak reef long-term protection, by designating it a preservation zone, with no access to areas except for scientific research, monitoring and law enforcement.	Director, CMO, KS Lawyers	H	X					KS Legislators, Governor	With support from KSPLA, KSPZC
Protect coconut and land crabs, their habitat, foraging and nesting areas through inclusion of forest and beach areas in conservation and protection zones.	Director, KS Lawyers	H	X					KS Legislators, Governor	With support from KSPLA, KSPZC

Table 1. Continued

Action	Responsible staff	Priority	2004	2005	2006	2007	2008	Partners	Comments
Investigate the feasibility of restricting sea urchin harvest and develop appropriate regulations.	Director, CMO	M			X			KS Legislators, Governor, BMR	Get technical assistance from MAREPAC.
Explore feasibility and need to restrict harvest of giant clams (e.g. through size and bag limits).	Director, CMO	M			X			KS Legislators, BMR	
Explore the feasibility and need to regulate harvest of hard coral for lime production.	Director, CMO	L					X	KS Legislators, BMR	
Declining Turtles									
Establish a "wildlife preservation reserve" at Kmekumer Islands for the protection of Hawksbill nesting beaches, nesting turtles and eggs.	Director, KS Lawyers	H	X					HOTL, KS Legislature, Governor	
Include critical turtle habitat, foraging areas, and nesting areas in a "conservation zone".	Director, KS Lawyers	H	X					KS Legislature, Governor	Coordinate with BMR turtle project.
Maintain accessibility of nesting beaches for turtles (limit infrastructure and disturbances).	Director	H	X	X	X	X	X	KS Zoning and Planning	
Support existing national laws and work with the national government to improve existing laws.	Director	H	X	X	X	X	X	PCS, BMR	Coordinate with BMR turtle project.
Endangered Dugongs									
Give Ngederrak reef long-term protection, with no-take, and no motorboat access to areas except for scientific research, monitoring and law enforcement.	KS Lawyers, Director	H	X					KS legislators, Governor	Coordinate with education and research activities
Identify and protect additional critical dugong habitat areas.	CMO, KS lawyers	H		X	X	X	X	KS legislators, Governor.	Get technical assistance from MAREPAC.
Investigate the need and feasibility of implementing control measures to reduce the risk of motorboat collision with dugong, and implement measures if necessary.	CMO, KS lawyers	H		X	X	X	X	KS legislators, BMR, DFW	Get technical assistance from MAREPAC.
Forest/terrestrial issues									
Maintain the existing law preventing cutting of mangroves or other vegetation below the high-tide line.	Director, KS lawyers	H	X					KS legislature, Governor	
Ensure that all timber harvested in the Management Area is approved by the Traditional Leadership and State Government.	Director, KS lawyers	H	X					HOTL, KS legislature	
Prohibit the planting of introduced ornamental/exotic species in the Management Area. Ensure that any new development projects plant only native species.	Director, KS lawyers	H	X					KS legislature, Governor	
Maintain existing regulations that prohibit the taking of any fauna or flora from tourist areas.	Director, KS lawyers	H	X	X	X	X		KS legislature, Governor	Get assistance from the tourism industry.
Include key roosting sites of fruit bats and nesting sites of Micronesian Megapodes in preservation and conservation zones where possible.	CMO, KS lawyers	H	X	X	X	X	X	KS legislature, Governor, PCS	Incorporate latest research findings.

Table 1. Continued

Action	Responsible staff	Priority	2004	2005	2006	2007	2008	Partners	Comments
Support national efforts to develop workable regulations for the Endangered Species Act.	Director, KS lawyers	H	X	X				KS legislature, Governor, HOTL	Regulations were proposed in Jan 03
Develop regulations to prohibit the harvesting of all birds and bird eggs except for introduced species in the Management Area.	Director, KS lawyers	H	X					KS legislature, Governor, HOTL	Coordinate with PCS birdlife project.
Climate Change									
Support efforts to establish a network of protected areas through Palau.	Director	H	X	X	X	X	X	KS legislature, Governor, TNC, MRD	
Establish additional protected areas and/or modify existing areas to include areas resistant and resilient to coral bleaching and source and sink areas.	Director	H		X	X	X	X	KS lawyers, legislature, Governor.	Dependent on recommendations of NOAA/AIMS/TNC study.
Support existing national strategies for response to climate change, including strengthening coral reef protection.	Director	H	X	X	X	X	X	KS lawyers, legislature.	Refer to national climate change implementation strategy (OERC 02)
Tourism and recreational activities									
Maintain existing tourist activity areas, permits and regulations	Director, KS lawyers	H	X	X	X	X	X	KS legislature, Governor	
Ensure that visitors can access all designated tourist activity areas.	Director, KS lawyers	H	X					KSPLA, KSPZC, KS legislature	
Designate a new tourist activity site at Ngkesiil Island Beach and explore feasibility of opening additional new sites.	Director, KS lawyers	H	X					KSPLA, KSPZC, KS legislature	
Make it a requirement that all local caretakers must maintain their designated areas and shelters.	Director, KS lawyers	H	X					KSPLA, KSPZC, KS legislature	
Regulate diving and snorkeling activities in the Management Area to reduce site congestion and damage to corals and increase site safety.	Director, KS lawyers	H	X					KS legislature, Governor	
Continue to limit use of personal watercraft to designated water sport zones.	Director, KS lawyers	H	X					KS legislature, Governor	
Maintain existing restrictions and closures of marine lakes until research by the Coral Reef Research Foundation is completed. Closures will be re-assessed based on research findings and recommendations.	Director, KS lawyers	H	X	X	X	X	X	CRRF, KS legislature, Governor	
Based on the research mentioned above, assess feasibility of permitting a limited number of tourists to visit big jellyfish lake under strict controls.	Director, CMO	M		X	X			CRRF, KS legislature, Governor	

Table 1. Continued

Action	Responsible staff	Priority	2004	2005	2006	2007	2008	Partners	Comments
Require all marine tour-guides operating within the Management Area to meet the State’s marine tour guide certification standards and ensure new guides receive training and are certified to meet the standards.	Director, KS lawyers	H		X	X	X	X	KS legislature, Governor	
Develop and adopt guidelines for snorkeling in Jellyfish Lake, as per designation as a special use tourism zone.	CMO, KS Lawyers	H	X					KS legislature, Governor	Consult tourism industry & CRRF
Develop and adopt guidelines for snorkeling and diving in Mandarin Fish Lake as per designation as a special use tourism zone.	CMO, KS Lawyers	H	X					KS legislature, Governor	Consult tourism industry & marepac members
Regulate diving at Ngerumekaol (Ulong Channel) during critical spawning times (10 days before the new moon from May to August) to minimize disruption of spawning activities. Diving is permitted between 10am and 2pm, as long as divers follow the guidelines for diving during spawning season outlined in the tour-guide certification manual, and comply with conservation zone regulations (zoning section 5.2.4).SCUBA diving is prohibited, except for research purposes, between 2pm and 10am, 10 days before the new moon from May - August.	Director, KS lawyers	H	X					KS legislature, Governor	Need to monitor effectiveness of closure.
Develop and implement comprehensive water safety regulations for Koror State, including safety equipment requirements, and limiting passenger number on boats, to increase the safety and quality of all water activities and tours in the Management Area.	Director, KS lawyers	H	X					KS legislature, Governor	
Ban feeding of sharks in the Management Area.	Director, KS lawyers	H	X					KS legislature, Governor	Work with local shark conservation groups.
Infrastructure, construction and development activities									
Maintain existing State regulations, permit and review process for all development activities, including sand mining and dredging operations.	Director, KS lawyers	H	X	X	X	X	X	KS Legislature, Governor	Include Historic Preservation Office in review process.
Encourage and support the establishment of a coordinated development review process for all proposed development activities in Koror State.	Director, KS lawyers	H		X				KS Legislature, Governor	
Work with the Planning and Zoning Commission and KSPLA to ensure that environmental issues are addressed in building codes and standards for Koror State.	Director, KS lawyers	M		X				KS Legislature, Governor	
Ensure any new or expanded sand mining operations in the Management Area follow appropriate procedures and are subject to environmental impact assessment and follow best practice.	CMO	H	X					KS Legislature, Governor	

Table 1. Continued.

Action	Responsible staff	Priority	2004	2005	2006	2007	2008	Partners	Comments
Support state and national efforts to develop an effective waste management system, including efforts to move the existing rubbish dump away from its present location and ensure adequate rehabilitation of the area.	Director	H		X				KS public works, KS legislature, Governor	
Support and assist Marine Resources to develop national aquaculture regulations and guidelines.	Director	H	X	X				MRD, EQPB	
Develop state criteria for aquaculture based on national guidelines.	CMO / KS lawyers	M			X	X		EQPB, PCS	Dependent on national guidelines
Boating Activities									
Maintain existing regulations for motorboat registration.	Director, KS Lawyers	H	X	X	X	X	X	KS Legislature, Governor	
Define boat channels and/ or implement speed restrictions in areas that have high boat activity, are ecologically significant or sensitive to erosion.	Director, KS Lawyers	M		X				KS Legislature, Governor	Link with dugong, turtle & tourism actions.
Develop and implement comprehensive water safety regulations for Koror State.	Director, KS Lawyers	H		X				KS Legislature, Governor	Consult BPS.
Amend Koror State Public Law No. K6-121-2001 regarding the monetary value of damage to coral reef ecosystems located in Koror State's Waters, to include the use of settlement funds to cover legal costs and site restoration efforts (if required).	Director, KS Lawyers	H	X					KS Legislature, Governor	
Develop a formal procedure to deal with ship groundings within the State (including legislation if necessary).	CMO, Director	H	X					KS Legislature, Governor	Consult EQPB, BPS, MAREPAC.
Work with national and state agencies to establish a task force to deal with ship groundings (including PICRC, EQPB, AG, States, BMR).	Director	M		X				BMR, PICRC, EQPB, AG, State Governments.	
Develop a formal procedure to deal with oil spills within the State.	CMO, Director	M			X			EQPB, PBS,	
Invasive Species									
Make it illegal to plant introduced ornamental/exotic species in the Management Area. Ensure that any new development projects plant only native species that already occur at that site.	Director, KS Lawyers	H	X					KS legislature, Governor	Consut BoA, OERC, PCC.
Prohibit taking of domestic animals such as cats, dogs or monkeys to the Management Area	Director, KS Lawyers	H	X					KS legislature, Governor	

Table 2. Enforcement of Regulations

Action	Responsible staff	Priority	2004	2005	2006	2007	2008	Partners	Comments
Harvest of fish									
Maintain regular 24-hour surveillance of fishing areas to check for illegal fishing activities, with daily variation of patrol routes.	KS Rangers	H	X	X	X	X	X	DFW, MEERT	Continue to collaborate with DFW and MEERT to strengthen and coordinate state and national enforcement efforts. The State must be given authority from the National Government before it can enforce national laws.
Undertake routine random checks of boats to ensure compliance with regulations.	KS Rangers	H	X	X	X	X	X	DFW, MEERT	
Undertake weekly random patrols of fishing markets to ensure compliance with fishing regulations and business licenses.	KS Rangers	H		X	X	X	X	DFW, MEERT	
Enforce the existing fishing license system.	KS Rangers	H	X	X	X	X	X	DFW, MEERT	
Assist enforcement of national regulations that require foreign fishing vessels to stow their fishing gear within 12 miles of the barrier reef	KS Rangers	H		X	X	X	X	DFW, MEERT	Dependent on State being given authority by the national govt.
Increase patrols of Ngerumekaol (Ulong Channel) and other protected spawning aggregation sites during the fish spawning period (presently April through July).	KS Rangers	H		X	X	X	X	DFW, MEERT, MRD	Can coordinate with education programmes
Maintain regular daily patrols of protected areas to check for illegal fishing activities.	KS Rangers	H	X	X	X	X	X	DFW, MEERT	
Harvest of invertebrates									
Maintain regular 24-hour surveillance of fishing areas to check for illegal fishing activities (with daily variation of patrol routes).	KS Rangers	H	X	X	X	X	X	DFW, MEERT	Coordinate with national law enforcement efforts
Declining Turtles									
Assist Division of Fish and Wildlife to strengthen enforcement of laws against harvesting turtle eggs and turtles (size and seasonal bans) through more turtle patrols and random checks of boats.	Director, KS Lawyers	H		X	X	X	X	MRD	Dependent on the State being given authority by the national govt.
Maintain regular patrols to enforce reserves and conservation zones relevant to turtles.	KS Rangers	H	X	X	X	X	X	DFW	
Endangered Dugongs									
Assist the Division of Fish and Wildlife to strengthen enforcement of laws prohibiting harvesting of dugongs.	KS Rangers	H		X	X	X	X	AG's office, DFW	Dependent on the State being given authority by the national govt.
Maintain regular daily patrols of Ngederrak Reef to check for illegal entry and fishing activities.	KS Rangers	H	X	X	X	X	X		

Table 2. Continued

Action	Responsible staff	Priority	2004	2005	2006	2007	2008	Partners	Comments
Forests and terrestrial issues									
Review regular surveillance patrols to ensure they adequately cover terrestrial areas for enforcement of state regulations on mangroves, harvesting of fruit-bats and birds, and protection of flora and fauna on the Rock Islands.	Director	H	X	X	X	X	X		
Assist Division of Fish and Wildlife to enforce relevant national laws. eg. laws on bird harvest.	Director, KS Lawyers	H		X	X	X	X	AG's office, DFW	Dependent on the State being given authority by the national govt.
Tourism and recreational activities									
Maintain regular 24-hour surveillance of tourist activity areas to check for illegal fishing activity and compliance with tourism regulations.	KS Rangers	H	X	X	X	X	X	DFW	Get assistance from tour-operators.
Conduct intensive monthly checks for Rock Island use and fishing permits on all vessels and at tourist activity areas.	KS Rangers	H	X	X	X	X	X		Establish a better monitoring system and database.
Work with Peleliu State and MEERT to strengthen protection of dive sites south of German Channel by coordinating and supporting enforcement of regulations in Koror and Peleliu waters.	Director, KS Rangers	H		X	X	X	X	Governor, DFW	
Enforce boat safety regulations.	KS Rangers	H	X	X	X	X	X	BPS	
Infrastructure, construction & development activities									
Conduct regular surveillance of development sites and ensure that all state regulations are being followed.	KS Rangers	M		X	X	X	X	KSPW, KSPZC, EQPB	National regulations are also enforced and monitored.
Monitor the existing sand mining operation area near Taberrakl Reef to ensure compliance with permit conditions.	KS Rangers	M		X	X	X	X	KSPW, KSPZC, EQPB	
Issue citations and work with the KS Zoning & Planning commission and KSPLA to take legal action if necessary.	KS Rangers	M		X	X	X	X	KSPW, KSPZC	
Boating Activities									
Undertake checks of boats during daily patrols to ensure compliance with boat licensing and safety requirements.	KS Rangers	H	X	X	X	X	X	BoPS	
Maintain existing search and rescue procedures within the State.	KS Rangers	H	X	X	X	X	X	DFW, MOJ	
Invasive species									
Work with national government/quarantine to ensure adequate inspection (for invasive species) of boats entering Koror State waters from other countries.	Director	H		X				Quarantine, BoA, OERC, EHS.	Incoming boats are already inspected to some extent by quarantine & EHS.
Assist the Bureau of Agriculture and other agencies to eradicate the Nile Tilapia (<i>Oreochromis niloticus</i>) from Koror State.	Director, KS Rangers	M	X	X				Tilapia Eradication Task Force	Support on-going efforts by providing access to sites.

Table 2. Continued.

Action	Responsible staff	Priority	2004	2005	2006	2007	2008	Partners	Comments
Continue to support efforts to remove COTS from reefs. Methods should incorporate the latest research findings, such as timing efforts before COTS spawn.	CMO, KS Rangers	M	X	X	X	X	X	PICRC, Tour-ops (Planet Blue)	Consult scientits (PICRC etc) for latest research efforts.
Train beach boys and rangers to identify and remove invasive terrestrial plant species, particularly from tourist areas and areas around summer houses.	Director, CMO	H		X	X	X	X	PCC	Dr Joel Miles can provide training. Recommend yearly updates.
Continue rat control programs in the Rock Island Management Area to reduce rat populations.	Director / Rangers	H	X	X	X	X	X	BoA, Public health, EHS	Seek technical advice from SPREP.
Remove invasive plant species from the Management Area and regularly re-visit areas to monitor for and remove new growth.	CMO, Rangers	M	X	X	X	X	X	BoA, PCC, OERC	Develop an action plan before removal.
Assess feasibility and need, and if necessary develop control/eradication programs for introduced animals including monitor lizards, cockatoos, parrots, monkeys in the Management Area.	CMO	L				X		BoA, PCC, PCS	Coordinate with BoA bird/rat project and PCS birdlife project.
Employ hunters to regularly cull introduced cockatoo and parrot populations in the Management Area.	Director/CMO	L				X	X	BoA	Only if proven feasible.

Table 3. Education and Awareness

Actions	Responsible staff	Priority	2004	2005	2006	2007	2008	Partners	Comments
Harvest of fish									
Publicize harvesting regulations and conservation areas through brochures, posters, newspaper, radio, television, and presentations and signs on docks or other public places.	Rock Island Development Officer (RDO) & Social market specialist (SMS)	H	X	X	X	X	X	PCS, PICRC, CORAL, ICRAN	Must be updated regularly to reflect any regulatory changes.
Develop and implement targeted awareness and education programs for resource users (including tourists) to increase their knowledge and understanding of the importance of fish resources and the reasons for regulations and restrictions.	RDO & SMS	M		X	X			PCS, ICRAN, PICRC, BMR, PCC	Co-ordinate with other agencies educational programs where possible.
Publicize through newspapers, magazines and radio the results of fish monitoring programs and significant changes in fish-stocks.	RDO & SMS	H		X	X	X	X	Agencies conducting monitoring	Co-ordinate with other agencies educational programs where possible.
Harvest of invertebrates									
Publicize harvesting regulations and conservation areas through brochures, posters, newspaper, radio and television, and signs on docks or other public places.	RDO & SMS	H	X	X	X	X	X	PCS, PICRC, BMR, PCC, CRRF	Must be updated regularly to reflect any regulatory changes.
Develop and implement targeted awareness and education programs for resource users (including tourists) to increase their knowledge and understanding of the importance of invertebrate resources and the reasons for regulations and restrictions.	RDO & SMS	M		X	X			PCS, PICRC, BMR, PCC	Co-ordinate with other agencies educational programs where possible.
Publicize in the newspaper and the radio the results of invertebrate monitoring programs and significant changes in invertebrate-stocks.	RDO & SMS	H		X	X	X	X	Agencies conducting monitoring.	Publicize research findings whenever studies are completed.
Declining turtles									
Develop and implement a turtle awareness campaign focusing on the following issues: *Increasing awareness of size and seasonal restrictions on turtle harvesting. *Increasing public awareness on the importance of limiting disturbance of nesting turtles and protecting nests. *Increasing awareness on turtle life cycle, why turtles are endangered, their cultural significance and why it is important to protect them.	RDO	M			X	X	X	PCS, BMR (MCPA)	Co-ordinate with other agencies educational programs where possible. As programs have already been developed by PCS and BMR, Koror State should play a supporting role rather than develop new programs.
Develop and implement a turtle awareness campaign that targets tourists specifically to discourage them from buying turtle products in Palau.	RDO	M			X			PCS, BMR	Similar to advertisement placed by Etpison Museum in 2004 "Alii" magazine.

Table 3. Continued.

Actions	Responsible staff	Priority	2004	2005	2006	2007	2008	Partners	Comments
Publicize in the newspaper and the radio the results of turtle monitoring programs.	RDO & SMS	M				X	X	PCS, BMR	Dependent on timing of research activities.
Endangered dugongs									
Support national government efforts to increase public education about dugongs.	RDO	M		X	X	X	X	PCS, MRD, DFW	Provide support whenever possible.
Forest/ terrestrial issues									
Increase awareness of all regulations relating to plants and animals of the Rock Islands.	RDO	H		X				PCS, BoA	Include information in fact sheets
Develop and implement targeted awareness and education programs for resource users to increase their knowledge and understanding of the importance of terrestrial habitat and resources, and the reasons for regulations.	RDO & SMS	M			X	X	X	PCS, BoA	Support on-going efforts where possible.
Climate change									
Support national efforts to increase awareness of climate change and its impacts.	RDO	L				X	X	MRD, OERC	Refer to national climate change strategy.
Tourism & recreational activities									
Continue to strengthen communication and cooperation between Koror State and tour-operators through regular meetings, and liaison with tour groups.	RDO	H	X	X	X	X	X	BTA, PVA	
Designate a tourism liaison person at Koror State (and make this known to PVA, BTA and all tour operators).	Director	H	X						
Work with local tour guides and agencies to implement the marine tour guide certification program for Koror State.	RDO / CMO	H	X	X	X	X	X	PCS, BTA, PVA	
Publicize tourist activity areas and regulations, including Rock Island Use Permit information, through brochures, posters, and publications such as the "Alii" visitor magazine, radio, and television. This information will also be presented in the tour-guide training course.	RDO & SMS	H	X					ICRAN, PCS	Update and develop fact sheets.
Develop educational and awareness material for tourists and locals explaining the environmental and cultural significance of the Rock Islands-Southern Lagoon Area and how they can help protect it.	RDO & SMS	M		X				CORAL, PCS, KS Cultural affairs, Belau National Museum	Get input from tour-ops, BTA, PVA. Link to tour-guide manual.
Develop a litter awareness campaign to encourage all visitors to the Management Area to reduce the amount of trash they produce and take all trash with them when they leave, including food scraps and cigarette butts, and reasons why.	RDO & SMS	M		X				KS Public Works, EQPB, DFW	Build on/ coordinate with existing awareness campaigns
Encourage tour-operators to reduce the amount of trash they generate by using reusable containers and biodegradable packaging.	SMS	L					X		Include in the tour guide training course.

Table 3. Continued.

Actions	Responsible staff	Priority	2004	2005	2006	2007	2008	Partners	Comments
Work with tour-operators to develop a coral reef monitoring program to assess diver and snorkeler impacts on key dive and snorkel sites, increase environmental awareness, and strengthen relationships between the government and tourism industry.	CMO/ RDO	M		X				PICRC (GCRN node)	Could combine with earth day activities. Also get assistance from CORAL.
Infrastructure, construction & development activities									
Develop awareness materials to increase awareness of any new development codes/regulations that affect the Management Area, through brochures, posters, newspaper, radio and television.	RDO	L				X		KSPW, KSPZC	Timing depends on development of regulations.
Develop a litter awareness campaign to encourage all users (tourists and locals) of the Management Area to reduce the amount of trash they produce and take all trash with them when they leave, including food scraps and cigarette butts, and reasons why	RDO, SMS	M			X			KSPW, KSPZC	Combine with campaign targeting tourists.
Boating activities									
Develop and implement a program to increase awareness of boat regulations (safety requirements, speed restrictions) and reasons for their development.	RDO & director	M		X				MOJ, PVA, BTA.	Work with MOJ on national initiative.
Increase awareness of environmental regulations applicable to boating.	RDO & SMS	M		X					
Develop a program to promote environmentally friendly boating practices.	RDO & SMS	M			X				
Develop a program to encourage boat operators to report any injured or dead turtles and dugongs they observe.	RDO & SMS	H		X				PCS	
Invasive species									
Support national efforts to increase awareness of invasive species.	RDO	M		X	X			OERC, MRD, BoA	Coordinate with National Invasive Weed committee and and Task force of Invasive Animal species.
Develop educational and awareness material for tour-operators and tour-guides on marine and terrestrial invasive species and ask them to report any new or unusual species they observe.	RDO & CMO	H		X				PCC, BoA.	Get assistance from Dr. Joel Miles and the national invasive weed committee and invasive animal species taskforce.

Table 4. Research and Monitoring

Actions	Responsible staff	Priority	2004	2005	2006	2007	2008	Partners	Comments
Harvest of fish									
Establish a permanent monitoring program at Ngerumekaol spawning aggregation site to monitor the number of groupers aggregating and map the size of the aggregation (at least three key species and at least annually).	CMO & Conservation Rangers (CR)	H		X	X	X	X	PICRC, CRRF, TNC, PCS	Refer to recommendations outlined in Rhodes, 2003.
Identify and assess the significance of spawning aggregation sites other than Ngerumekaol.	CMO & CR	M			X	X	X	PICRC, CRRF, TNC, PCS	
Continue annual monitoring of fish populations (other than grouper) at Ngerumekaol.	CMO & CR	H	X	X	X	X	X	PICRC	PICRC conducts regular monitoring of 23 fish species every 6 months.
Continue annual monitoring of fish and invertebrates at Ngederrak reef and control sites (non-protected reefs outside Ngederrak).	CMO & CR	H	X	X	X	X	X	PICRC, CRRF, C3	Refer to existing reports and build on previous research.
Conduct annual fish monitoring of permanent monitoring sites at German Channel, Ngemelis and Ngerechong.	CMO & CR	H	X	X	X	X	X	PCS, C3, PICRC	Refer to survey reports by C3 and PCS for details.
Provide access to sites and encourage PICRC and Bureau of Marine Resources to undertake research into sustainable harvest levels, and provide logistical support or funding where possible.	Director, Governor, KSL	H	X	X	X	X	X	PICRC, BMR, PCS, CRRF	PICRC would like to assess MPA effectiveness at MPA sites in Koror State.
Support research into overall recreational, subsistence and commercial fishing limits for species of concern and evaluate feasibility and effectiveness of possible strategies for implementing these limits.	Director, Governor, KS Legislature.	H		X	X	X	X	PICRC, BMR, PCS, CRRF	PICRC conducted a Palau wide survey on subsistence fishing in 2003, PCS also conducted a survey of Koror State in 2003.
Harvest of Invertebrates									
Encourage and support research into life cycles of vulnerable invertebrate species such as sea urchins, coconut crabs and land crabs.	CMO, Director	M			X	X	X	PICRC, CRRF	Seek external funding to support research where possible.
Establish permanent monitoring transects at Ngerumekaol spawning aggregation site to monitor invertebrate populations.	CMO & CR	H		X	X	X	X	PICRC, CRRF, BMR, PCS	PICRC only monitors fish species.
Continue annual monitoring of fish and invertebrates at Ngederrak reef and designated control reefs.	CMO & CR	H	X	X	X	X	X	PICRC, CRRF, C3	
Conduct annual monitoring of fish and invertebrates at permanent monitoring sites at German Channel, Ngemelis and Ngerechong.	CMO & CR	H	X	X	X	X	X	PICRC, PCS, C3	

Table 4. Continued.

Actions	Responsible staff	Priority	2004	2005	2006	2007	2008	Partners	Comments
Continue annual monitoring of fish and invertebrates at Ngederrak reef and designated control reefs.	CMO & CR	H	X	X	X	X	X	CRRF, C3	CRRF started monitoring in 2002.
Conduct annual monitoring of fish and invertebrates at permanent monitoring sites at German Channel, Ngemelis and Ngerechong.	CMO & CR	H	X	X	X	X	X	PCS, C3	Refer to PCS and C3 survey reports.
Declining Turtles									
Support national turtle project to assess all beaches for nesting activity to determine a nesting baseline.	CMO & CR	H		X	X	X	X	BMR, PCS	
Establish a monitoring program on nesting frequency of hawksbill sea turtles at key nesting sites.	CMO & CR	H		X	X	X	X	BMR, PCS	BMR has received funding for a turtle program and has staff designated to this project. KS should assist BMR staff.
Establish a monitoring program on turtle numbers to evaluate impacts of turtle harvesting in Palau and determine how effective existing harvesting restrictions are.	CMO & CR	H		X	X	X	X	BMR, PCS	
Encourage and support research on nesting success rates and healthy levels of nesting.	Director, CMO	H		X	X	X	X	BMR, PCS	
Assist national or regional efforts to establish a turtle-tagging program to find out range of hawksbill and green turtles	Director, CMO, CR	H		X	X	X	X	TNC, BMR, PCS	TNC conducted tagging in 2002.
Endangered Dugongs									
Support research on the ecology of the dugong population in Palau.	CMO	H	X	X	X	X	X	TNC, MRD, C3	Provide in-kind or financial assistance when needed.
Support the continuation of aerial surveys of dugongs through in-kind or financial assistance. Surveys should be repeated every 5 years.	CMO	H					X	TNC, MRD, C3	Last survey was completed in 2003 and should be repeated in 5 years.
Support seagrass surveys in Koror State to identify preferred dugong foraging areas.	CMO	M		X	X	X	X	MRD, PICRC, C3	Provide in-kind or financial assistance when needed.
Monitor the status of dugong habitat every 5 years.	CMO	H					X	MRD, PICRC, C3, TNC	Coordinate with seagrass and aerial surveys.
Forest/terrestrial issues									
Support and encourage surveys of fruit bat and bird populations and critical habitat and nesting areas.	CMO	M	X	X	X			PCS	PCS has an on-going bird project. KS staff should assist with field work when possible and KS should provide access to study sites.
Support and encourage research into sustainable harvest levels and seasons for fruit bats and pigeons.	CMO	L			X	X		PCS	
Support and encourage research into cockatoo and eclectus parrot populations, their impact on the native palm and control measures.	CMO	L			X	X		PCS, BOA	
Support vegetations surveys (including mangroves) of the Rock Islands	CMO	L				X	X	BOA	

Table 4. Continued.

Actions	Responsible staff	Priority	2004	2005	2006	2007	2008	Partners	Comments
Climate change									
Support studies to identify areas resistant and resilient to coral bleaching, and sources and sinks of larvae and coral recruits.	Director , CMO	M	X	X				PICRC, MRD, TNC	Support on-going NOAA/ AIMS/ TNC research.
Support the development of remote sensing techniques to design effective networks of protected areas, monitor coral reef health, and provide an early warning system of climate-induced stress.	CMO, RDO	L	X	X	X	X	X	PICRC	Assist GEF world bank research efforts by providing access to sites & logistical support.
Support research into the effect of climate change induced impacts on the occurrence of coral disease in Palau.	CMO	L	X	X	X	X	X	PICRC	Assist GEF world bank research efforts by providing access to sites & logistical support.
Develop an early warning system and response strategy for coral bleaching or other natural events.	CMO	M		X				PICRC, GCRMN node	Will provide a system for tour-ops etc. to report coral bleaching.
Monitor limestone forests and coastal vegetation on the Rock Islands following extended droughts to check for establishment of invasive species, and remove any established species.	CMO, CR			X	X	X	X	BoA, PCC, KS	Get technical assistance from Dr Joel Miles. Involve youth groups in clean up efforts.
Establish a long-term program to monitor shoreline erosion.	CMO, RDO	M		X	X	X	X	CR	Refer to monitoring plan for methods.
Continue to monitor jellyfish populations in Jellyfish Lake and other marine lakes to assess recovery from the 1998 El Nino event, and develop a response strategy for future El Nino events.	CMO	H	X	X	X	X	X	CR, CRRF	Provide logistical or financial support if possible.
Tourism and recreational activities									
Conduct regular monitoring of key dives sites to assess long-term impact from divers and snorkelers	CMO & CR	H	X	X	X	X	X	C3, PICRC, tour-operators	Refer to monitoring plan for methods.
Encourage and support research to determine the impacts of diver disturbance on grouper spawning activities.	CMO	M			X			TNC, PICRC, PCS	Refer to monitoring plan for methods.
Encourage and support research to assess if Manta Rays are being impacted by diver disturbance at cleaning stations.	CMO	M			X			PICRC, PCS	Refer to monitoring plan for methods.
Support research on water flow patterns in Ongeim'l Tketau and other marine lakes.	CMO	M			X			CRRF	Coordinate with CRRF.
Monitor erosion of beach areas through regular surveys and visual comparisons of photographs over time.	CMO, RDO	M		X	X	X	X	Rangers	Refer to monitoring plan for methods.
Regularly monitor the number of visitors at tourist areas including jellyfish lake, dive sites and beaches, and develop a database to consolidate results.	CMO, RDO	H	X	X	X	X	X	Rangers	Refer to monitoring plan for methods.

Table 4. Continued.

Actions	Responsible staff	Priority	2004	2005	2006	2007	2008	Partners	Comments
Conduct regular visitor satisfaction surveys to get feedback on management strategies.	RDO, CMO	H		X	X	X	X	PVA, BTA	Coordinate with any ongoing efforts.
Support and encourage research to determine the ecological and infrastructure carrying capacity of popular dives sites and tourist areas.	CMO , Director	H		X	X	X	X	CORAL, PICRC, TNC	Links with monitoring activities at Ngemelis and Gernman Channel.
Assess the feasibility of placing restrictions on tourist numbers at sites where congestion is a problem or carrying capacity is being exceeded.	CMO	M		X				CORAL, BTA, PVA	Get input for tour-ops.
Explore feasibility of developing a special 'eco-friendly operator accreditation' to reward environmentally conscious operations, including restaurants that comply with wildlife regulations (with any breach of regulations resulting in loss of accreditation).	Director, RDO	L			X			KS Legislature, Governor, PVA, BTA, PCS	Could also provide tax incentives, reduced licence fees etc.
Infrastructure, construction and development activities									
Conduct more detailed research/monitoring into the impacts of the Malakal sewage outfall on the marine environment using biological indicators such as plants and animal tissues, and sediments.	CMO	M			X			BMR, EQPB, PICRC	Explore funding opportunities, ideally should assess before and after sewage upgrade.
Conduct monitoring/research to determine if the Dolphins Pacific research facility, located on Ngeruktabel Island, is impacting the marine environment	CMO	M			X			EQPB, BMR, PICRC	Will need to get assistance from outside scientists.
Conduct more detailed monitoring/research to determine the impacts of the M-dock rubbish dump on the surrounding ecosystem (plants and animals).	CMO / KSPW	M		X	X			EQPB, OERC	Coordinate with dump closure. Explore funding possibilities.
Support the development of a water quality-monitoring program around Koror and adjacent to development activities, including the Dolphins Pacific Research Facility on Ngeruktabel Island.	CMO	L				X	X	EQPB	Provide logistical support (boat & staff).
Develop a monitoring program of seagrass and coral reef areas and include areas in the vicinity of development activities to assess environmental impact. This should include assessment of sedimentation, loss of seagrass, and damage to coral.	CMO	M			X	X	X	PICRC, BMR	Coordinate with PICRC.
Support studies on the effect of human activities (such as sewage discharge & pollution), on the occurrence of coral disease in Palau.	CMO	L	X	X	X	X	X	PICRC	Assist GEF world bank research efforts by providing access to sites & logistical support.
Develop an annual monitoring program of seagrass and coral reef areas and include areas in the vicinity of development activities to assess environmental impact.	CMO				X	X	X	PICRC, MRD	Coordinate with seagrass watch.

Table 4. Continued.

Actions	Responsible staff	Priority	2004	2005	2006	2007	2008	Partners	Comments
Support research on water flow patterns in Jellyfish Lake and other marine lakes.	CMO / Director	M			X			CRRF	Provide logistical or financial support if possible.
Boating Activities									
Work with national government to assess the value of the State's coral reef systems based on commercial, subsistence, cultural and environmental values.	Director/CMO	M	X	X				OERC, PICRC	Support ongoing evaluation of Palau's reefs.
Strengthen the current reporting system and develop a database for turtle and dugong injuries and fatalities.	CMO & RDO	H		X				PCS, DFW	Coordinate with MAREPAC members
Invasive Species									
Develop a reporting system and response strategy for invasive species.	CMO	H		X				OERC,	Enlist help of all people who utilise the Management Area.
Investigate new/alternate control methods for rat eradication and establish trials in the Management Area.	CMO, CR	M			X			BoA, National Invasive Species Taskforce.	Seek technical assistance from SPREP.
Assess and regularly monitor the distribution and area covered by invasive plants on the Rock Islands.	CMO, CR	M		X	X	X	X	BOA	Coordinate with on-going efforts to eradicate invasive plants. Involve community groups.
Assess and regularly monitor the distribution and area covered by the introduced marine hydroid.	CMO, CR	H		X	X	X	X	PICRC, CRRF, BMR,	Seek external funding source.
Support research into the ecology of the introduced hydroid to determine its impact on Palau's marine ecosystems.	CMO, CR	M		X	X	X	X	PICRC, CRRF, BMR.	Provide in-kind or financial support for research.
Support research into the distribution and ecology of the newly observed anemone- believed to be <i>Aiptasia</i> sp. in Ongeim'l Tketau (Jellyfish Lake).	CMO	H	X	X	X	X	X	CRRF, PICRC	CRRF has done preliminary surveys of distribution.
Initiate studies into the impacts and potential control measures for introduced animals including cockatoos, monitor lizards, parrots and monkeys in the Management Area.	CMO	L			X			PCS, BoA	Try to incorporate into ongoing research projects where possible.

Table 5. Direct Management

Action	Responsible staff	Priority	2004	2005	2006	2007	2008	Partners	Comments
Tourism Management									
Install and maintain mooring buoys at all regularly dived shipwrecks, new snorkeling sites and other frequently used tourist sites.	Director/ rangers	H	X	X	X	X	X	BTA	
Maintain composting toilets and basic shelters at tourist sites on the rock islands.	Rangers/ Beach boys	H	X	X	X	X	X		
Open designated tourist activity areas that are not currently accessible to all tourists. This includes the development of basic shelters and composting toilets.	Director/ KS Lawyers	H	X	X				KS legislators, HOTL, Governor	Get assistance from KSPLA, KSPZC.
Develop site plans for tourist beaches that include recommended maximum user capacity based on facilities, and a maintenance program to maintain the natural environment and visitor amenity.	CMO, RDO	H		X				BTA	
In addition to facilities provided at tourist areas, provide basic shelters and composting toilets at popular areas that are used by locals.	Director	M		X	X	X	X	KSPW, KSPLA, KSPZC	On-going project.
Explore feasibility of improving the RIMA permit to enhance its marketability, durability and management, and undertake periodic reviews of permit fees to ensure that they continue to provide the necessary funding for sustainable management.	CMO, RDO, Director, KS Finance	M			X			Governor, HOTL, KSL, BTA, PVA,	Review types of permits used in other tourism destinations (eg. pacific, caribbean).
Financial Management									
Continue to fund departmental programs through state budget allocations.	Director	H	X	X	X	X	X	KS Legislators, Governor, HOTL	
Continue to seek and apply for international grants to fund research and conservation projects within the Management Area.	Director, RDO, CMO	H	X	X	X	X	X	ICRAN, NFWF, NOAA, CORAL etc.	
Prepare an annual work plan and budget linked to the Management Plan. This should also include staffing requirements.	Director, RDO, CMO	H	X	X	X	X	X	Governor	
Continue to submit quarterly work progress and budget expenditure reports to ensure accountability.	Director, RDO, CMO	H	X	X	X	X	X		
Annually review and assess permit fees based on annual budget requirements.	Director / KS Finance.	H	X	X	X	X	X		
Prepare an annual report on number of tourists entering Palau, number of rock island use permits and revenue raised.	Director, RDO	H	X	X	X	X	X	KS Finance	

Table 5. Continued.

Action	Responsible staff	Priority	2004	2005	2006	2007	2008	Partners	Comments
Staffing Management									
Review and amend the organizational structure of the Department of Conservation and Law Enforcement to include conservation and enforcement officers within the Rangers Program.	Director	H	X					Governor, KS Legislature	
Increase number of Rangers to enable 4 Conservation and 12 Law Enforcement Officers.	Director	H	X					Governor, KS Legislature	Make request in Year 1 for inclusion in Year 2 staffing and budget.
Adopt the Koror State Rangers Compliance Program and annually review and update the program.	Director	H	X	X	X	X	X	TNC	Incorporate regulatory changes etc.
Develop a more detailed ranger compliance program that includes staff numbers, roles, training needs, and staff annual review performance.	Director	M	X	X				TNC	
Develop handbooks for the coastal resource management and beach boys program, which includes staff numbers, roles, administrative procedures, training needs, and staff annual review performance.	Director/ administrative assistant	M	X	X					
Make the 'coastal management officer' a permanent position within the Department of Conservation & Law Enforcement. This will enable the State to effectively coordinate and lead monitoring programs	Director, RDO	H	X					Governor, KS Legislature	
Continue to work with local and international organizations and agencies to build the department's capacity, and strengthen community outreach, conservation and research initiatives in the Management Area.	Director	H	X	X	X	X	X		
Continue to strengthen staff capacity by regularly enrolling staff in local and off-island training programs.	Director	H	X	X	X	X	X	Governor	
Administration									
Maintain the existing administration of the Management Area.	Governor, KS Legislature, HOTL	H	X	X	X	X	X		
Maintain existing State procedure to resolve conflicts between departments.	KS Lawyers	H	X	X	X	X	X	KS Legislature, Governor, HOTL	
Prepare an annual report on monitoring and research activities, linked to the Management Plan.	CMO	H	X	X	X	X	X		

Table 5. Continued.

Action	Responsible staff	Priority	2004	2005	2006	2007	2008	Partners	Comments
Prepare an annual report on education and awareness programs, linked to the Management Plan.	RDO , SMS	H	X	X	X	X	X		
Review and amend the existing permitting process for research activities within the Management Area.	CMO/ KS Lawyers	M		X					Consult MRD and MAREPAC members.
Protect important research areas through inclusion in conservation or protection zones wherever possible. Priority should be given to long-term research areas that are ecologically significant such as coral spawning sites.	CMO, KS Lawyers	M		X				KSL, Governor	Include in PAN where possible.
Conduct regular patrols to enforce conservation areas with research sites and ensure that researchers have relevant permits.	KS Rangers	M		X	X	X	X	PICRC	
Increase awareness of research permits requirements for Koror State.	RDO / CMO	M		X	X	X	X	PICRC, CRRF, PCS, BMR	
Develop informational material to distribute with research permits.	RDO /CMO	M		X					
Review permitting process for professional photography (still and film) for professional photographers who are not permanent residents of Koror State, and make changes as necessary.	Director / KS Lawyers	L				X		KS Legislature, Governor	Consult tourism industry.
Increase awareness within the tourism industry of professional photography permit requirements.	RDO	L				X		BTA, PVA	

1.4. Review of Action Plan

The Action Plan will be reviewed and updated yearly as part of the annual review of the Management Plan. This will include an assessment of the progress made in implementing the management actions, as well as the effectiveness of implemented management actions.

1.4.1 Implementation of Management Actions

The progress made in implementing the management actions will be monitored yearly by comparing management activities to actions outlined in the 5-year program. To simplify reporting, comments can be inserted directly into the excel worksheet for each respective action table. Worksheets can then be copied and updated to reflect any necessary changes to management actions or the 5-year timeline.

1.4.2 Indicators of Effective Management

The effectiveness of the management actions contained in the plan will be measured using the biological and social indicators list in Table 7 below. These indicators will be monitored over the next 5 years using the monitoring program outlined in Section 2.

If management actions are effective, short-term indicators should be achieved at the completion of the 5-year program. However long-term indicators may take many years to achieve and will require on-going management after the 5 year program. For example significant changes in the number, size and distribution of size classes of long-lived species such as turtles will take many years, considering that hawksbill and green turtles take up to 30 years to reach sexual maturity. In addition the effectiveness of management actions is often dependent on changes in human behavior, which will likely occur over time as public awareness and education about the Management Area grows.

Table 6. Indicators of effective management

Management Objective	Indicators of effective management
<p>Harvest of Fish</p> <ul style="list-style-type: none"> ❖ Provide for sustainable fishing in the management the area, with priority to local communities, and with the minimum amount of regulations necessary to maintain fish resources for the future. ❖ Minimize any further damage to fish habitat, allow existing damaged areas to recover, and manage the fishing pressure to achieve an increase in the health of fisheries within the Rock Islands Management Area during the next 5 years. 	<p>In the short-term, fish populations, average fish size and weight, and diversity of fish are maintained.</p> <p>In the long term, increase in fish abundance, average size and weight and diversity. And return to normal size distribution and sex ratio of fish populations.</p>
<p>Harvest of Invertebrates</p> <ul style="list-style-type: none"> ❖ Provide for sustainable harvesting in the management area, with priority to Koror residents, and with the minimum amount of regulation necessary to maintain invertebrate resources for the future. ❖ Minimize further loss of invertebrate habitat, allow depleted areas to recover, and manage harvesting pressure to achieve an increase in the health of invertebrate populations within the Rock Islands Management Areas in the next 5 years. 	<p>In the short-term, invertebrate abundance, size, weight and diversity are maintained.</p> <p>In the long-term, invertebrate abundance, size, biomass and diversity increase. And invertebrate habitat is maintained.</p>

<p>Declining Turtle Populations</p> <ul style="list-style-type: none"> ❖ Decrease turtle and turtle egg harvesting, and increase the number of hawksbill turtles nesting and eggs hatching and the overall number of hawksbill and green turtles within the Rock Islands Management Area during the next 5 years. ❖ In the long-term, restore the health (sex ratio, size distribution) of hawksbill and green turtle populations in the management area. 	<p>In the short-term, increase in the number of Hawksbill and Green Turtles laying eggs, the number of eggs hatching and juvenile turtles.</p> <p>In the long term, increase in Hawksbill and Green Turtle populations, increase in average turtle size, return of normal size distribution and sex ratio.</p>
<p>Endangered Dugongs</p> <ul style="list-style-type: none"> ❖ Protect the dugong population in the Management Area from illegal harvesting and prevent death and injury caused by boat collisions. ❖ In the long-term, restore the dugong populations in the Management Area to a healthy population size. 	<p>Decrease in number of dugongs killed through illegal harvest and injuries caused by boat collision.</p> <p>In the long term, increase in number of dugongs (calves and adults) and recovery of population to a normal size/age distribution and sex ratio.</p>
<p>Forest and Terrestrial Issues</p> <ul style="list-style-type: none"> ❖ Maintain the natural forest cover, including mangroves, on all of the Rock Islands and prevent the introduction and spread of invasive plants and animals. ❖ Control the level of harvest of fruit bats and native birds to ensure that healthy populations of the full range of native species are maintained. ❖ Allow limited harvest of timber for traditional/cultural use under specific approval process on a case-by-case basis. 	<p>Natural forest cover is maintained on the Rock Islands and the area of mangroves does not decrease.</p> <p>No increase in the area covered by invasive species, and no new invasive species are established.</p> <p>The population of fruit bats and native birds does not decrease, and diversity of birds is maintained.</p>
<p>Tourism and Recreational Activities</p> <ul style="list-style-type: none"> ❖ Provide suitable sites and basic infrastructure to support high quality tourism experiences in the Management Area that have minimal environmental impact and meet visitor expectations, but also increases their understanding of the area and inspires them to visit again. ❖ Maintain access to the Rock Islands for nature-based recreation by local residents that has minimal environmental impact and supports cultural values. ❖ Ensure sufficient financial return from tourism activities in the Management Area for sustainable management. ❖ Strengthen relationship between Koror State and Tour-operators 	<p>Tourist activity areas have ample, clean facilities and tourists express satisfaction with their experiences in the Rock Islands.</p> <p>Environmental and cultural information is distributed to tourists and information signs are installed at tourist activity areas.</p> <p>Continued use and enjoyment of the Management area by locals.</p> <p>State revenue generated from tourism funds all management activities.</p> <p>Maintenance of healthy marine and terrestrial systems.</p> <p>Koror State works in partnership with the tourism industry on tourism related management issues.</p>
<p>Infrastructure, Construction & Development Activities</p>	
<ul style="list-style-type: none"> ❖ Prevent development in the Management Area that would degrade the natural character, environment or tourism values of the area, while allowing necessary infrastructure to support better management of the area to protect those values. ❖ Minimize degradation and pollution impacts in the 	<p>Development enhances tourism values and does not degrade the natural character or environment of the Management Area.</p> <p>Development activities around Koror have negligible environmental impact</p>

<p>Management Area from development around Koror.</p> <ul style="list-style-type: none"> ❖ Enable aquaculture projects in the Management Area that have negligible environmental impact. 	<p>on the Management Area.</p> <p>All proposed aquaculture projects are assessed through a thorough EIS & feasibility study prior to approval.</p> <p>Aquaculture projects are successful & have negligible environmental impact on the Management Area.</p>
<p>Climate Change</p> <ul style="list-style-type: none"> ❖ Enhance the resilience of coral reef systems in the Rock Islands-Southern Lagoon area to climate change by including key resistant and resilient areas throughout Palau in a nationwide network of protected areas designed to maximize survival and recovery following coral bleaching events. 	<p>Key resistant and resilient areas within the Management Area are adequately protected and integrated into a nationwide network of protected areas.</p>
<p>Control of Invasive Species Actions</p> <ul style="list-style-type: none"> ❖ Prevent the establishment of new marine or terrestrial invasive species, and reduce the distribution and area covered by existing invasive species in the Management Area. 	<p>No new marine or terrestrial invasive species are established.</p> <p>Decrease in area affected by invasive plant or animal species.</p>
<p>Boating Activities</p> <ul style="list-style-type: none"> ❖ Ensure safe and enjoyable boating activities that have minimal impact to marine and terrestrial ecosystems in the Management Area. ❖ Reduce the loss and degradation of coral reefs in the Management Area due to ship groundings and boat anchoring. 	<p>Increased compliance with boat and water safety regulations.</p> <p>Fewer turtle and dugong injuries and fatalities caused by boat collision.</p> <p>Negligible boat collision or anchor damage observed on coral reefs.</p> <p>Funds available for reef restoration efforts.</p>
<p>Financial, Staffing, & Administrative Needs</p> <ul style="list-style-type: none"> ❖ Raise resources and staff numbers within the Department of Conservation and Law Enforcement to the levels required to effectively implement conservation and enforcement programs in the Management Area. ❖ Increase the effectiveness of administration and enforcement procedures within the Department of Conservation and Law Enforcement. 	<p>Adequate funding and resources available to fully implement this management plan.</p> <p>Increased number, frequency & effectiveness of enforcement patrols.</p> <p>Streamlined administrative & permitting procedures in place.</p> <p>All staff have knowledge of State regulations and permit requirements.</p> <p>Staff well-trained in and knowledgeable on all aspects of Rock Island Management.</p> <p>Monitoring plan being implemented & the results being used to make management decisions.</p>

Chapter 2. Monitoring Program

This monitoring program deals specifically with biological monitoring and scientific research and is presented in two separate tables on the following pages. The tables outline the management issue that is addressed, the management action and objective of the action, provide a brief explanation of the recommended monitoring approach, and an approximate time-line for monitoring, as well as who is responsible for coordinating the monitoring/research and who will implement it.

Scheduling for activities is an approximation only, designed to assist in prioritizing activities as well as developing work plans. Many of the research activities are dependent on other research institutions and thus depend on their monitoring programs, staff availability etc.

A monitoring program for social indicators will be developed separately to this program, in conjunction with the development of the education and awareness programs.

Compliance monitoring that assesses the effectiveness and enforcement of regulations is included in the Koror State Ranger Compliance Plan, which is an attachment to the Management Plan.

2.1 Biological Monitoring

Table 7. Summary of monitoring Activities

Monitoring activity	Program year					Year 1 (approximate only)												Year 2 (approximate only)												
	1	2	3	4	5	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ngerumekaol grouper monitoring																														
Fish monitoring at Ngerumekaol.																														
Invertebrate and substrate monitoring at Ngerumekaol.																														
Fish monitoring at Ngederrak and control reefs.																														
Invertebrate and substrate monitoring at Ngederrak and control reefs.																														
Fish, invertebrate monitoring at German Channel, Ngemelis and Ngerechong.																														
Monitor nesting frequency of hawksbill and green turtles.																														
Monitor turtle numbers.																														
Dugong aerial surveys.																														
Status of dugong habitat.																														
Distribution and area covered by invasive plants on the Rock Islands.																														
Early warning system and response strategy for coral bleaching.																														
Monitor limestone forest and coastal vegetation after draughts.																														
Monitor shoreline erosion.																														
Monitor jellyfish populations in Jellyfish and Lake and other marine lakes.																														
Long-term impact of divers and snorkelers at key dive sites.																														
Beach erosion.																														
Visitor numbers at tourist areas.																														
Visitor satisfaction surveys.																														
Seagass and coral reef monitoring.																														
Strengthen the current reporting system and develop a database for turtle and dugong injuries and fatalities.																														
Develop a reporting system and response strategy for invasive species.																														
Assess and regularly monitor the distribution and area covered by the introduced marine hydroid.																														

NB: Includes monitoring activities for program year 1 only.

Dependent on funds

NB: Includes monitoring activities for program year 2 only.

Dependent on funds

Table 8. Biological Monitoring Program

Management Issue	Action	Objective	Approach	Schedule	Leader	Implementer
Harvest of Fish	Establish a permanent monitoring program at Ngerumekaol spawning aggregation site to monitor the number of groupers aggregating and map the size of the aggregation (at least three key species and at least annually).	To detect changes over time in the abundance and size structure of the 3 key grouper species (<i>Epinephelus fuscoguttatus</i> , <i>Epinephelus polyphekadion</i> , <i>Plectropomus areolatus</i>) aggregating at Ngerumekaol.	Work with TNC and CRRF to determine the location of permanent monitoring sites. Establish a minimum of 2 transects per species for the three main fish species (<i>Epinephelus fuscoguttatus</i> , <i>Epinephelus polyphekadion</i> , <i>Plectropomus areolatus</i>) as recommended by Rhodes 2003.	Year 2 - 5. 3 days per month (1 day per species) between 5 and 1 day prior to the new moon between May - Aug.	Koror State	CMO, CR with assistance from PICRC, PCS.
Harvest of Fish	Continue annual monitoring of fish populations (other than grouper) at Ngerumekaol.	Determine biomass of fish at Ngerumekaol and compare to biomass of fish at non-protected areas to determine effectiveness of protected areas.	Monitor number and size of 23 fish species using 50m transects and 20 min timed swims.	Year 1 -5, every 6 months.	PICRC	PICRC, CR, CMO
Harvest of Invertebrates	Establish permanent monitoring transects at Ngerumekaol spawning aggregation site to monitor invertebrate populations and composition of substrate.	To detect changes over time in the composition and condition of substrate and the abundance and size structure of invertebrate populations.	Underwater visual surveys of substrate type and invertebrates using 50m point-intercept transects. Use standard methodology for all sites (Ngederrak, Ngemelis etc.).	Year 1- 5. A minimum of one survey per year, coordinate with fish surveys.	Koror State.	CMO, CR, PICRC
Harvest of Fish & Invertebrates	Continue annual monitoring of fish, invertebrates and substrate at Ngederrak reef and control sites (non-protected reefs outside Ngederrak).	To detect changes over time in the substrate type, and abundance and size structure of fish and invertebrate species at Ngederrak Reef compared to non-protected reefs.	Underwater visual surveys of fish and invertebrates. Refer to CRRF study and methods manual for Ngederrak Reef.	Year 1- 5. A minimum of one survey per year. Fish surveys occur late April - May, Invertebrate surveys late August - September.	Koror State, CRRF,	CMO, CR, CRRF, PICRC
Harvest of Fish & Invertebrates, Tourism & Recreational activities	Conduct annual monitoring of fish, invertebrates and substrate at permanent monitoring sites at German Channel, Ngemelis and Ngerechong.	To detect changes over time in the composition and condition of substrate, and abundance and size structure of fish and invertebrate species at German Channel, Ngemelis and Ngerechong.	Underwater visual surveys of fish using 50 m transects and 50m point-intercept transects for substrate and invertebrates. Refer to PCS study of Ngemelis and C3 study of German Channel and Ngerechong for details.	Year 1 - 5. A minimum of one survey per year, every 6 months if possible.	Koror State	CMO, CR with assistance from PICRC, PCS and others.
Harvest of Turtles	Establish a monitoring program on nesting frequency of hawksbill and green sea turtles at key nesting sites.	Determine changes over time in the number of hawksbill and green turtles nesting in the Management Area.	Surveys of beaches for nesting activity or nesting turtles.	Year 2 - 5, from December - January and June - August. Intensive in year 1.	Koror State, BMR	CMO, CR, BMR staff, PCS
Harvest of Turtles	Establish a monitoring program on turtle numbers to evaluate impacts of turtle harvesting in Palau and determine how effective existing harvesting restrictions are.	Determine changes over time in abundance and size of Hawksbill and Green Turtles in the Management Area.	Field surveys. Work with BMR, TNC to develop best methods.	Year 2 - 5. Coordinate with BMR turtle project.	Koror State, BMR	CMO, CR, BMR staff, PCS

Table 8. Continued.

Management Issue	Action	Objective	Approach	Schedule	Leader	Implementer
Harvest of Dugongs	Support the continuation of aerial surveys of dugongs through in-kind or financial assistance. Surveys should be repeated every 5 years.	Determine changes over time in the abundance and size structure of Dugongs in the Management Area.	Aerial surveys using standard methodology used in previous surveys.	Year 5.	Koror State, TNC, PCS.	CMO, CR, TNC and others.
Harvest of Dugongs	Monitor the status of dugong habitat every 5 years.	Monitor changes over time in dugong habitat.	Coordinate with seagrass and aerials surveys.	Year 5.	Koror State, MRD, PICRC, C3, TNC	CMO, CR, PICRC, C3, TNC
Invasive species/ forest terrestrial issues.	Assess and regularly monitor the distribution and area covered by invasive plants on the Rock Islands.	Determine changes over time in the distribution and area covered by invasive plants in the Rock Islands, and assess effectiveness of control programs.	Map location and cover of invasive species. Coordinate with invasive control efforts. Map area covered prior to removal and monitor changes yearly. Time removal efforts before plants flower.	Year 2 - 5. Atleast yearly.	Koror State, BOA	CMO, CR,
Climate change, invasive species	Develop an early warning system and response strategy for coral bleaching or other natural events.	To develop a system to report coral bleaching, COTS outbreaks, new species and put in place a quick and standardized response.	Designate a responsible agency (KS or PICRC, PCS, GCRMN, OERC) and work with relevent agencies to determine a standard response strategy.	Year 2	Koror State, PICRC, PCS	Koror State, PICRC, PCS, Tour-ops, BTA
Climate change, invasive species	Monitor limestone forests and coastal vegetation on the Rock Islands following extended droughts to check for establishment of invasive species, and remove any established species.	To identify and control the spread of invasive species before they become established.	Survey limestone forests and coastal vegetation (particulary any new gaps in the forest) for invasive species. Record location and approximate area covered. Collect sample for identification. Remove plants either physically (preferred) or with use of pesticide - dependent on species. Consult BoA, PCC or National Weed Committee for best control method.	Year 2 -5. During and after droughts.	Koror State,	CMO, CR, BoA, PCC
Climate change	Establish a long-term program to monitor shoreline erosion.	To detect changes in the size of beach areas over time caused by environmental variables such as increasing tide height, storm activitiy etc.	Measure the size of beaches using survey equipment and visually compare photographs.	Year 2 -5. Annual surveys.	Koror State	RDO, CR, CMO
Climate change	Continue to monitor jellyfish populations in Jellyfish Lake and other marine lakes to assess recovery from the 1998 El Nino event, and develop a response strategy for future El Nino events.	To monitor changes in the populations of mastigias jellyfish in the marine lakes after the impact of the 199701998 ENSO event.	Work with CRRF to develop best sampling frequency and response strategy. Monitor temperature, salinity, dissolved oxygen by depth and monitor abundance and size structure of Mastigias jellyfish. Refer to CRRF methods manual for description of methods.	Year 1 - 5.	Koror State, CRRF	CRRF, CMO, CR.
Tourism & Recreational Activities	Conduct regular monitoring of key dives sites to assess long-term impact from divers and snorkelers	To detect changes over time in the composition and condition of substrate at German Channel, Ngemelis and Ngerechong.	Same as substrate monitoring of Ngemelis, German Channel and Ngerechong. 50m point-intercept transects.	Year 1 - 5. A minimum of one survey per year, every 6 months if possible.	Koror State	CMO, CR with assistance from PCS and others.

Table 8. Continued.

Management Issue	Action	Objective	Approach	Schedule	Leader	Implementer
Tourism & Recreational Activities, Climate Change	Monitor erosion of beach areas through regular surveys and visual comparisons of photographs over time.	To detect if high levels of visitation are altering the size of beaches and structure of coastal vegetation.	Measure the size of the beach at tourist activity areas (using survey equipment), survey coastal vegetation and visually compare photographs. Compare to non-tourist beaches.	Year 2 -5. Annual surveys.	Koror State	RDO, CR, CMO
Tourism & recreational activities	Regularly monitor the number of visitors at tourist areas including jellyfish lake, dive sites and beaches, and develop a database to consolidate results.	To determine visitor numbers and use patterns in the Management Area.	Monitor the number of visitors at tourist areas and dive sites and trial a logbook system in which all tour-operators record numbers of customers by boat and destination.	Year 1 -5.	Koror State	RDO, CMO, CR, BTA
Tourism & recreational activities	Conduct regular visitor satisfaction surveys to get feedback on management strategies.	Determine if tourists are satisfied with the facilities, permit fees, quality of diving/snorkeling in the Management Area.	Distribute surveys for tourists (and the tourism industry) to tour-operators or at the airport.	Year 2 - 5. At least once per year.	Koror State, BTA, PVA	RDO, BTA, PVA
Infrastructure, construction & development activities	Develop a monitoring program of seagrass and coral reef areas and include areas in the vicinity of development activities to assess environmental impact. This should include assessment of sedimentation, loss of seagrass, and damage to coral.	To detect changes over time in seagrass and coral reef areas caused by adjacent development activities.	Work with PICRC to develop monitoring program. Explore possibility of expanding PICRC's existing coral and seagrass monitoring program to include additional sites in the Management Area.	Year 3 -5.	Koror State, PICRC	CMO, CR, PICRC.
Boating activities, endangered dugongs, declining turtles	Strengthen the current reporting system and develop a database for turtle and dugong injuries and fatalities.	To establish a centralised system for people to report any dugong and turtle injuries, and database of results.	Work with PCS to strengthen existing system. Establish a data base at Koror State and PCS.	Year 2	Koror State, PICRC, PCS	CMO, RDO, CR, BoA
Invasive species (also climate change)	Develop a reporting system and response strategy for invasive species within the Management Area.	To establish a centralised system for people to report sightings of new species and put in place an efficient and standardized response.	Designate a responsible agency (KS or PICRC, PCS, GCRMN, BoA, MRD, OERC) and work with relevant agencies to determine a standard response strategy.	Year 2	Koror State, PICRC, PCS, BoA, BMR etc.	Koror State, PICRC, PCS, BoA, BMR etc.
Invasive species	Assess and regularly monitor the distribution and area covered by invasive plants on the Rock Islands.	To track changes in the distribution and area covered by plants on the Rock Islands.	Identify location of invasive plants and map occurrence and cover annually.	Year 2 -5, at least once per year.	Koror State, BoA,	CMO, RDO, CR, BoA
Invasive species	Assess and regularly monitor the distribution and area covered by the introduced marine hydroid.	To determine if the Marine Hydroid is spreading in the Management Area.	Underwater surveys and spot checks to look for the hydroid. Work with CRRF to develop best method. Include hydroid in substrate monitoring at dive sites.	Year 1- 5.	Koror State, PICRC, CRRF	CMO, CR, PICRC, CRRF

2.2 Scientific Research

Table 9 Scientific Research

Management Issue	Action	Objective	Approach	Schedule	Leader	Implementer
Harvest of Fish	Identify and assess the significance of spawning aggregation sites other than Ngerumekaol.	To identify other grouper aggregation sites that need protection.	Work with PICRC, CRRF, fishermen to locate sites. Conduct underwater visual census surveys of aggregating fish.	Year 3 -5. Monthly checks between May - Aug.	Koror	CMO, CR with assistance from PICRC, PCS.
Harvest of Fish and Invertebrates	Provide access to sites and encourage PICRC and Bureau of Marine Resources to undertake research into sustainable harvest levels, and provide logistical support or funding where possible.	To determine if current levels of resource harvesting are sustainable.	Provide access to study sites, staff and boats to assist with field work or financial assistance if necessary.	Year 1 -5.	PICRC, BMR, Koror State	PICRC, BMR, CMO, CR
Harvest of Fish, Invertebrates, Turtles.	Support research into overall recreational, subsistence and commercial fishing limits for species of concern and evaluate feasibility and effectiveness of possible strategies for implementing these limits.	To determine sustainable levels of recreational, subsistence and commercial harvesting and identify effective strategies to implement levels.	Provide access to study sites, staff and boats to assist with field work or financial assistance if necessary.	Year 1 - 5	PICRC, BMR, PCS, CRRF, PCC, Koror State	PICRC, BMR, PCS, CRRF, PCC, Koror State
Harvest of Invertebrates	Encourage and support research into life cycles of vulnerable invertebrate species such as sea urchins, coconut crabs and land crabs.	To better understand the ecology of vulnerable invertebrate species to enable the development of improved resource management strategies.	Provide access to study sites, staff and boats to assist with field work or financial assistance if necessary.	Year 3 -5	Koror State and other local resource agencies.	Local resource agencies.
Harvest of Turtles	Support national turtle project to assess all beaches for nesting activity to determine a nesting baseline.	To identify important nesting beaches for hawksbill and green turtles and establish baseline nesting number in the Management Area.	Provide access to study sites, staff and boats to assist with field work.	Year 2 -5.	BMR, Koror State.	BMR, Koror State.
Harvest of Turtles	Encourage and support research on nesting success rates and healthy levels of nesting.	To identify the hatching success rate of hawksbill and green turtle eggs and determine what is the minimum level required to sustain Palau's turtle population.	Provide access to study sites, staff and boats to assist with field work.	Year 2 -5.	BMR, Koror State.	BMR, Koror State.
Harvest of Turtles	Assist national or regional efforts to establish a turtle-tagging program to find out range of hawksbill and green turtles	To determine how far hawksbill and green turtles migrate in order to develop better management strategies.	Provide access to study sites, staff and boats to assist with field work.	Year 2 -5.	BMR, TNC	BMR, TNC

Table 9. Continued.

Management Issue	Action	Objective	Approach	Schedule	Leader	Implementer
Harvest of Dugongs	Support research on the ecology of the dugong population in Palau.	To understand the lifecycle of the Palau dugong population to enable better management.	Provide access to study sites, staff and boats to assist with field work.	Year 1 -5.	BMR, TNC, C3, PICRC	BMR, consultants?
Harvest of Dugongs	Support seagrass surveys in Koror State to identify preferred dugong foraging areas.	To identify important dugong foraging areas to enable their protection.	Aerial surveys and field ground-truthing. Seagrass identification.	Year 2 - 5.	BMR, PICRC, C3, Koror state	MRC, PICRC, C3, Koror state
Forest & Terrestrial Issues	Support and encourage surveys of fruit bat and bird populations and critical habitat and nesting areas.	To assess the abundance of fruit bats and bird populations in the Management Area and identify critical habitat and nesting areas.	Highlight the need for this research and encourage its incorporation into on-going/proposed projects.	Year 1 -3.	Koror State, PCS, BoA and other agencies.	PCS, CMO, CMO
Harvest of Fish	Identify and assess the significance of spawning aggregation sites other than Ngerumekaol.	To identify other grouper aggregation sites that need protection.	Work with PICRC, CRRF, fishermen to locate sites. Conduct underwater visual census surveys of aggregating fish.	Year 3 -5. Monthly checks between May - Aug.	Koror	CMO, CR with assistance from PICRC, PCS.
Forest & Terrestrial Issues	Support and encourage research into cockatoo and eclectus parrot populations, their impact on the native palm and control measures.	To determine the impact of cockatoo and eclectus parrot populations on the Management Area.	Highlight the need for this research and encourage its incorporation into on-going/proposed projects.	Year 3 - 4.	Koror State, PCS, BoA and other agencies.	PCS, Koror State, BoA, consultants
Forest & Terrestrial Issues	Support vegetations surveys (including mangroves) of the Rock Islands	To document plant species, map vegetation types and monitor change over time of vegetation on the Rock Islands.	Highlight the need for this research and encourage its incorporation into on-going/proposed projects.	Year 4 -5.	Koror State, PCS, BoA and other agencies.	
Climate change	Support studies to identify areas resistant and resilient to coral bleaching, and sources and sinks of larvae and coral recruits.	To include areas that are resistant and resilient to coral bleaching, and sources and sinks of larvae and coral recruits in the PAN.	Support on-going NOAA/AIMS/TNC research by providing access to sites and logistical support if necessary.	Year 1 - 2.	PICRC, MRD, TNC, CRRF	
Climate change	Support the development of remote sensing techniques to design effective networks of protected areas, monitor coral reef health, and provide an early warning system of climate-induced stress.	To develop cost-effective remote sensing techniques to improve management of coral reefs.	Assist GEF world bank research efforts by providing access to sites and logistical support.	Year 1 - 5 on-going project, dependent on GEF group.	PICRC, OERC	GEF world bank coral reef research group on remote sensing

Table 9. Continued.

Management Issue	Action	Objective	Approach	Schedule	Leader	Implementer
Climate change	Support research into the effect of climate change induced impacts on the occurrence of coral disease in Palau.	To determine if the impacts of climate change are influencing the occurrence of coral disease.	Assist GEF world bank research efforts by providing access to sites and logistical support.	Year 1 - 5 on-going project, dependent on GEF group.	PICRC, OERC	GEF world bank coral reef research group on coral disease.
Tourism & Recreational Activities	Encourage and support research to determine the impacts of diver disturbance on grouper spawning activities.	To determine what impact human disturbance has on grouper spawning activities.	Underwater visual surveys of grouper behavior. Work with TNC, PICRC, CRRF on methods. Or contract consultants.	Year 3	Koror State, BMR, PICRC, TNC, CRRF	Consultants, CMO, CR, BMR, PICRC
Tourism & Recreation al Activities	Encourage and support research to assess if Manta Rays are being impacted by diver disturbance at cleaning stations.	To determine if diving should be regulated at Manta cleaning stations such as German Channel.	Highlight the need for this research. Provide access to sites and logistical support. Underwater visual surveys of manta ray behavior, literature review, ask tour-ops to monitor manta ray numbers.	Year 3.	Koror State, PICRC, BMR	CMO, CR, PICRC, BMR, consultants
Tourism & Recreational Activities, Climate Change	Support research on water flow patterns in Ongeim'l Tketau and other marine lakes.	To determine the rate of exchange of water between the marine lakes and lagoon and impact on El Nino events, sunscreen use etc.	Highlight need for this research. Provide access to marine lakes, logistical support and funding (if possible).	Year 3.	Koror State, CRRF, PICRC	CRRF, PICRC, Consultants
Tourism & recreational activities	Support and encourage research to determine the ecological and infrastructure carrying capacity of popular dives sites and tourist areas.	To determine the number of visitors that dive sites and tourist areas can sustain.	Highlight the need for this research. Provide access to sites, logistical support and funding.	Year 2 - 5.	Koror State, PICRC	CMO, CR, PICRC, consultants
Tourism & recreational activities	Assess the feasibility of placing restrictions on tourist numbers at sites where congestion is a problem or carrying capacity is being exceeded.	To minimize environmental degradation and congestion at dive sites and determine suitable strategies to regulate visitor numbers.	Work with BTA, PVA and the tourism industry to come up with possible solutions.	Year 2	Koror State, BTA, PVA	CMO, RDO, BTA, PVA

Table 9. Continued.

Management Issue	Action	Objective	Approach	Schedule	Leader	Implementer
Tourism & recreational activities	Explore feasibility of developing a special 'eco-friendly operator accreditation' to reward environmentally conscious operations, including restaurants that comply with wildlife regulations (with any breach of regulations resulting in loss of accreditation).	To provide an incentive for environmentally friendly practices within the tourism and hospitality industry.	Work with BTA, PVA and State and National agencies. Support and coordinate with any existing programs (DFW) rather than develop a new accreditation.	Year 3	Koror State	RDO, CMO, KS Legislature, PVA, BTA, PCS, DFW
Infrastructure, construction & development activities	Conduct more detailed research/monitoring into the impacts of the Malakal sewage outfall on the marine environment using biological indicators such as plants and animal tissues, and sediments.	To determine if the Malakal sewage outfall is impacting the marine environment.	Contract consultants or PICRC to undertake research. Seek outside funds for research.	Year 3	Koror State, BMR, EQPB, PICRC	Consultants and Koror State, BMR, EQPB, PICRC
Infrastructure, construction & development activities	Conduct monitoring/research to determine if the Dolphins Pacific research facility, located on Ngeruktabel Island, is impacting the marine environment	To determine if the Dolphins Pacific research facility is impacting the Management Area.	Contract consultants or PICRC to undertake research. Seek outside funds for research.	Year 3.	Koror State,	Consultants, CMO, CR, BMR, PICRC, EQPB
Infrastructure, construction & development activities	Conduct more detailed monitoring/research to determine the impacts of the M-dock rubbish dump on the surrounding ecosystem (plants and animals).	To determine if marine biota and habitat have been contaminated by run-off the dump.	Contract consultants to undertake research. Explore funding possibilities.	Year 2 -3 or coordinate with dump closure.	Koror State, EQPB	KSPW, CMO, EQPB
Infrastructure, construction & development activities	Support the development of a water quality-monitoring program around Koror and adjacent to development activities, including the Dolphins Pacific Research Facility on Ngeruktabel Island.	To monitor changes over time in water quality around Koror and adjacent to development activities.	Provide logistical support (boat and staff) and coordinate with existing EQPB monitoring program.	Year 4 - 5.	Koror State, EQPB	CMO, CR, EQPB

Table 9. Continued

Management Issue	Action	Objective	Approach	Schedule	Leader	Implementer
Infrastructure, construction & development activities	Support studies on the effect of human activities (such as sewage discharge & pollution), on the occurrence of coral disease in Palau.	To determine if human activities are influencing the occurrence of coral disease in Palau.	Assist GEF world bank research efforts by providing access to sites and logistical support.	Year 1 - 5 on-going project, dependent on GEF group.	PICRC, OERC	GEF world bank research group on coral disease
Boating	Work with national government to assess the value of the State's coral reef systems based on commercial, subsistence, cultural and environmental values.	To determine a monetary value for coral reefs in the Management Area, to ensure adequate compensation is given for damage to reef.	Support on-going evaluation of Palau's reef by providing access to sites, data and technical assistance.	Year 1 -2.	PICRC / OERC	Consultants, PICRC, OERC
Invasive species	Investigate new/alternate control methods for rat eradication and establish trials in the Management Area.	To determine the most effective and ecologically sensitive method of eradicating rats from the Management Area.	Request assistance from BoA, the National Invasive Task Force and SPREP.	Year 3.	Koror State, BoA	CMO, RDO, CR, BOA
Invasive species	Support research into the ecology of the introduced hydroid to determine its impact on Palau's marine ecosystems.	To determine what impact the introduced hydroid is having on Palau.	Provide funding or logistical support for a study into the ecology of the hydroid.	Year 2-5.	Koror State, PICRC, CRRF, BMR	CMO, CR, PICRC, CRRF, BMR
Invasive species	Support research into the distribution and ecology of the newly observed anemone- believed to be <i>Aiptasia</i> sp. in Ongeim'l Tketau (Jellyfish Lake).	To determine what impact the introduced anemone is having in Ongeim'l Tketau.	Provide funding or logistical support to continue research. CRRF has mapped the initial distribution.	Year 1-5.	Koror State, CRRF, PICRC	CMO, CR, CRRF, PICRC
Invasive species	Initiate studies into the impacts and potential control measures for introduced animals including cockatoos, monitor lizards, parrots and monkeys in the Management Area.	To determine if introduced animals are having negative impacts on the the Management Area and identify suitable control measures.	Highlight need for this research. Provide logistical or financial support if possible. Coordinate with other research projects where possible (eg. PCS bird life project).	Year 3.	Koror State, BoA, PCS, National Invasive Species Task Force	Consultants, BoA, PCS, National Invasive Species Task Force



Rock Islands - Southern Lagoon Area Management Plan 2004 — 2008



Volume 3 Background & Analysis

**Koror State Government
Republic of Palau
May 2004**

**Rock Islands Southern Lagoon Area
Management Plan
2004-2008**

**Volume 3
Background and Analysis**

Koror State Government
Republic of Palau

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FOREWORD

The Koror State Department of Conservation and Law Enforcement is responsible for day-to-day management and coordination of activities within the Management Area as well as enforcing all State laws. The department was founded in 1994 and consists of trained, ranked and uniformed rangers that maintain law and order, as well as preserve the unique natural resources of the state. It also has a "Rock Islands Facelift Program", which is responsible for maintaining the tourist activity areas in the Management Area and a Coastal Resources Management Office, whose primary focus has been the development of this comprehensive Management Plan and which will lead its implementation. The purpose of this management plan is to establish a comprehensive, coordinated management program for the Rock Islands-Southern Lagoon Area for the next 5 years.

Our department developed the management plan with assistance from The Nature Conservancy and Palau Conservation Society. The plan was developed over 2 years, using The Nature Conservancy's conservation area planning approach. The plan was reviewed and approved in June 2004, by a Task Force appointed by the Koror State Governor. The Task Force included representatives from the Governor's Office, House of Traditional Leaders, Koror State Legislature, Koror State Public Land Authority, Koror Planning and Zoning Commission, Koror Women's Group and the Ngarametal Association.

The management plan is divided into three volumes. Volume one is a brief, concise document that provides an overview of the management program without the specific details and can be read independently. Volume two is the Action Plan and Monitoring Program, it provides the details required to implement the plan such as timeline and manpower. Volume three is the Background and Analysis it provides the detailed background information and description of the methods used to make the actions.

This 5 year plan is an important first step in an on-going cycle of design, implementation and review, and should be viewed as a "working plan" rather than a static document. The plan will be reviewed, updated and modified yearly as more information becomes available and management strategies are tested for effectiveness.

The Koror State Department of Conservation and Law Enforcement will work closely with key stakeholders, and national and international resource agencies and organizations to implement the plan.

Sincerely,



Adalbert Eledui

Director, Koror State Dept. of Conservation and Law Enforcement

Approval Page

This plan has been reviewed and approved by the
Rock Island Management Area Executive Committee &
Governor John Gibbons

June 2004

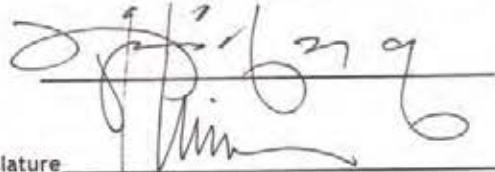
Governor John C. Gibbons




Rechucher Alex Merep, House of Traditional Leaders



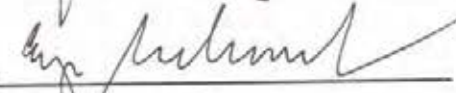
Balio Ngiraidong, Special Assistant, House of Traditional Leaders



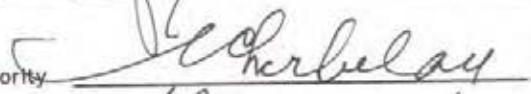
Millan Isack, Chairman Committee on Environment, Koror State Legislature



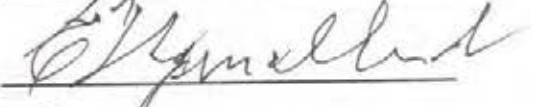
Eyos Rudimch, Chairman Committee on Tourism, Koror State Legislature



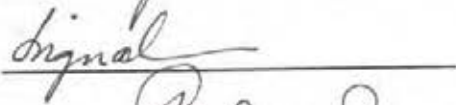
Viviana Ucherbelau, Board Member, Koror State Public Land Authority



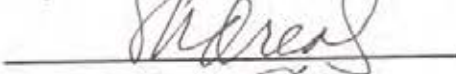
Ermas Ngiraelbaed, Board Member, Koror State Public Land Authority



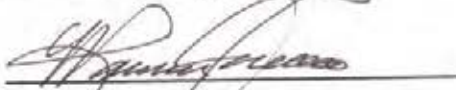
Tutoud Ngiralmau, Vice Chairman, Koror State Planning & Zoning Commission



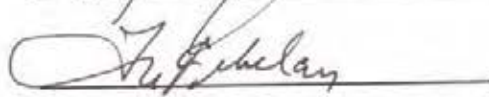
Sebastian Andreas, Board Member, Koror State Planning & Zoning Commission



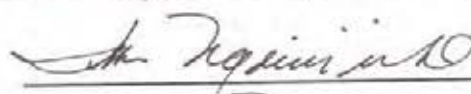
Roman Yano, Committee Chairman, Ngarametal Association



Florenca Elbelau, Koror Traditional Women's Group, Ngaramaiberel



Takeko Ngirairiki, Koror Traditional Women's Group, Ngaramaiberel



Adalbert Eledui, Director, Conservation & Law Enforcement

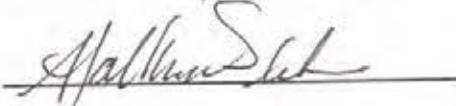


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2. PCS, 1998. Community Consultation Progress Report, submitted to SPREP.	
3. PCS, 1998. Four-year strategy for the Rock Islands Conservation Area, submitted to SPBCP.....	
4. SPBCP, 2000. Rock Islands Conservation Area, Palau, Transition Strategy 2000-2002.	
5. Smith 2002. Discussion Paper: Strategy outline for the Development and Implementation of a Management Plan for the Rock Islands Area of Koror State, Palau.	
Appendix 2: Conservation Area Planning Material	
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4. C3, 2003. Baseline Surveys and Threat Assessment of Dive Sites in Koror State.	
5. C3, 2003. Draft marine tour-guide manual for Koror State.....	
6. Matthews, 2004. Subsistence Fishing Activities in the Rock Islands. PCS report no. 2004-01.	
Appendix 4. Flora and Fauna of the Rock Islands-Southern Lagoon Management Area: Species Lists.	

1.0 Management Planning History

Long before modern conservation laws were developed, Palau's resources were managed by Traditional controls, such as bul (harvest restriction) and marine tenure. Although traditional marine tenure no longer exists within the Management Area, traditional controls have been maintained and are the basis of many modern day conservation initiatives. A Traditional Decree declared by the Ngarameketti Chiefs Council of Koror in 1973, still restricts harvesting of marine and terrestrial resources in the Rock Islands and the surrounding waters in the Management Area.

Modern day conservation initiatives are supported by a range of State laws that regulate: general resource use, recreational activities and designate protected areas within the Management Area (see Chapter 4 for more details). The Year 2000 Rock Islands Management and Conservation Act, which regulates recreational activities, provides much of the basis for current management activities in the Management Area. This Act will be replaced by passage of the Comprehensive Management Act that will accompany this Management Plan.

The Comprehensive Management Plan for the Rock Islands-Southern Lagoon Area is the culmination of 10 years of work by the Koror State Government and Palau Conservation Society (PCS) supported by the South Pacific Biodiversity Conservation Program (SPBCP) and The Nature Conservancy (TNC). Their collective efforts are outlined below.

Planning activities were initiated by the creation of the Koror State Department of Conservation and Law Enforcement (KSDCLE) in 1994. Creation of the Department enabled the development of State regulations on resource use and activities, and the designation of protected areas within the Rock Islands Area. A Rock Islands Use Act (RIUA) regulating tourist activities in the Rock Islands was established in 1997.

In order to improve the effectiveness of management activities in the Rock Islands Area, PCS supported by Koror State submitted a concept proposal to the South Pacific Biodiversity Conservation Program (SPBCP) for a "Rock Island Conservation Area Awareness and Concensus Building Project (Appendix 1) in October 1997. The proposal was successful and the Rock Islands was selected for the SPBCP, and designated a Conservation Area Project (CAP). Consequently Koror State through PCS was able to hire a Rock Islands Coordinator (RIC) -Charlene Mersai- in January 1998 to directly work on this program. One of Charlene's main tasks was to develop a community based comprehensive management strategy for the Rock Islands Area.

The first year of the Rock Island Conservation Area (RICA) Awareness and Concensus Building Project focused on awareness and concensus building among stakeholders of the Rock Islands. The RIC conducted extensive consultations with stakeholders in 1998 and 1999 and identified a range of issues and problems related to the Rock Islands. These are outlined in the Community Consultation Report prepared by Koror State and PCS for SPREP in 1998 (Appendix 1).

The consultation findings showed a clear consensus among stakeholders on the main problems in the Rock Islands Area although there was no agreement on how to solve them. However there was agreement that the Rock Islands Area and its associated activities should be treated as a management unit, and that the respective roles of the various stakeholders in managing the area and its uses needed to be coordinated and clarified. It became clear that the management of the Rock Islands by a comprehensive management plan would address these needs. This led to a further submission to the SPBCP by PCS and Koror State in November 1998 to fund the "Rock Islands Conservation Area Four-year strategy" (Appendix 1). The overall goal of the strategy was the effective implementation of a comprehensive management plan for the Rock Islands Area.

Nearing the completion of CAP'S four-year strategy, a transition strategy for the RICA during 2000 - 2002 was developed by the SPBCP Secretariat in consultation with Rock Islands CAP partners and stakeholders (see Appendix 1).

The efforts of the Department of Conservation & Law Enforcement and PCS resulted in the submission of proposal for the development and adoption of the Rock Islands Management Plan to the legislature of Koror State with the full support of the House of Traditional Leaders and Government of Koror. The Koror State Legislature endorsed the proposed strategic approach for formulating an intergrated management and conservation plan to the Rock Islands of Koror State on July 3, 2000.

In August 2000 the State Legislature amended the restrictive Rock Islands Use Act with the Year 2000 Rock Islands Management and Conservation Act. The Year 2000 Act was ammended in 2001 and continutes to regulate recreational activities in the Management Area.

In response to the request of the Traditional Leaders and resolution of the Koror State Legislature a strategy for developing and implementing a comprehensive and integrated management plan and was prepared. The strategy outline was prepared as a discussion paper in 2000 by the Koror State Government, PCS and The Nature Conservancy (TNC) (see Appendix 1). The Koror State Government adopted this strategy and development of the Management Plan began in 2000 with the appointment of an interim Coastal Management Officer (Ms Charlene Mersai) at Koror State to oversee its development. PCS (and the SPBCP) continued to support the State's efforts by providing the continued assistance and support of the Rock Islands Coordinator (Ms Ilebrang Olkeriil), who was funded by the SPBCP until December 2001.

Koror State adopted TNC's conservation area planning approach and tool in 2000 and a site conservation planning worskhop was held in November 2000. A detailed explanation of the conservation area planning approach is contained in Chapter 2 of this volume. The scientific information required for the CAP tool was collated by Ms Robin Pelc, a visiting graduate student from Stanford University volunteering at PCS, in 2003. With the assistance of the Rock Islands Coordinator she also began to develop an outline of the Management Plan.

Koror State appointed a new Coastal Management Officer (Dr. Katherine Chaston) to finalize the development of the management plan in January 2003. The State also absorbed the Rock Islands Coordinator position from PCS, with funding from the International Coral Reef Action Network (ICRAN). The Coastal Management Officer and Rock Islands Coordinator completed the Management Plan with support from Director of the Department of Conservation and Law Enforcement, TNC, and PCS in May 2004

Chapter 2. Determination of Management Issues

2.1 Overview of the Planning Process

The planning process was led by the Koror State Government and facilitated by The Nature Conservancy and Palau Conservation Society. The Management Plan was developed using the Nature Conservancy’s conservation area planning approach and tool. This approach is based on adaptive management- the planning process is on going and management actions are updated regularly to reflect environmental change and incorporate latest scientific knowledge.

Input from government agencies, community groups, biological experts and other key stakeholders (fishers, tourism industry) was vital to the planning process (Figure 1). Management goals and strategies were developed with input from stakeholders and review of existing management strategies and scientific data. TNC’s conservation area planning measures of success workbook (CAP tool) was used to refine and structure the management goals and determine management issues. Management issues and actions were further refined through additional consultations with key stakeholders.

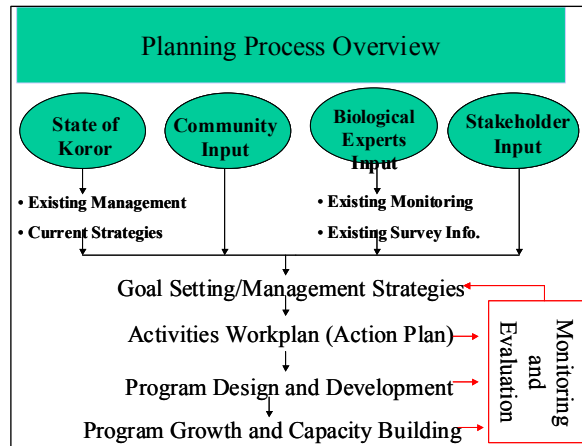


Figure 1. Overview of the Management Planning Process

The monitoring and evaluation of management strategies and actions is another critical component of the planning process. During the annual review of action plan, stakeholders will be given an opportunity to provide feedback on management strategies and thus continue to be involved in managing the area.

2.2. Conservation Area Planning

The Nature Conservancy’s conservation area planning approach actively involves stakeholders in the planning process. The approach draws on local knowledge and expertise and existing scientific information to identify perceived environmental threats (stresses) and their causes (sources), and select biodiversity targets (systems) to focus management actions on.

Management issues and actions are developed in consultation with key stakeholders and are reviewed and updated regularly. Stakeholders are given an opportunity to provide feedback on the area’s management during the annual review process. The site conservation planning framework is outlined in Figure 2 and explained in detail in Appendix 2.

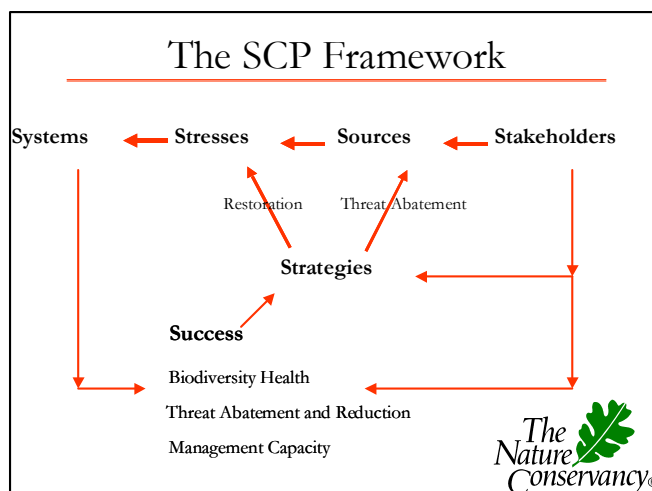


Figure 2. The TNC site conservation planning framework

The first Site Conservation Planning (SCP) planning workshop for the Management Area was held in November 2000. The workshop was facilitated by TNC and included environmental experts and scientists, representatives from traditional and community groups, government and non-government agencies. A list of participants is included in Appendix 2. During this workshop ecological targets were identified and their ecological status assessed using the CAP tool, which is described below.

2.2.1 Biodiversity Targets and Stresses

Conservation area planning begins with understanding the management “targets” or “systems”, including the natural processes that maintain them. The identification of focal management targets or systems is the basis for all subsequent steps in site planning, including identifying threats, developing strategies, and measuring success. Targets can be important species (e.g. hawksbill turtles), ecological communities (e.g. reef fish) and ecological systems (e.g. coral reefs). The primary purpose of management targets in site planning is to guide and focus management strategies - what critical threats and persistent stresses must be abated in order to maintain or improve the condition of the targets or systems? By focusing on a limited number of targets and systems, it is easier to devise effective management strategies. Therefore, in selecting targets and systems it is important to ensure that the focal targets and systems represent and capture all the levels of biodiversity in the site. As management actions produce results, or as circumstances affecting the sites change, then there may be a need to reassess what the targets should be - site planning is an iterative process requiring adaptive management.

The preliminary management targets selected for the Rock Islands - Southern Lagoon area were:

1. Marine Lake Ecosystem
2. Limestone Forest Systems
3. Mangrove Systems
4. Seagrass Systems
5. Coral Reef Systems
6. Large Reef Food Fish
7. Turtles
8. Beaches and Cays

“Stresses” are the types of degradation and impairment affecting the targets and systems at a site. It is the stresses on the targets that must be abated to ensure the ecological integrity of the targets or systems. There are two ways to abate stresses, one is to lessen the stress itself, the other is to address the source causing the stress. The stresses that affect each target are listed below.

i) Marine Lake Ecosystem

The term “marine lakes” refers to the lakes that formed as the limestone Rock Islands were uplifted and had any surface water connection to the lagoon or ocean cut off. The term has, however, also been applied to semi-enclosed ‘lakes’ that do have variously sized surface openings to the sea. For this target, only the fully enclosed marine lakes are included. There are 12 meromictic (lakes in which hydrogen sulfide gas replaces oxygen at depth) and approximately 50 holomictic lakes (mixed, oxygenated water column) in Palau. Due to the lack of surface water connections to the sea, each lake has developed a unique assemblage of organisms, although many of the same species are found in several of the lakes. The marine lake ecosystem was selected due to their unique and largely unknown biota, and due to their tourism value. Nested under this target are the jellyfish, fish, corals, mangroves, and other invertebrates (sponges, etc.). Overall, the current health of the systems is currently rated as “Good”.

The stresses (and their ratings) are:

- Thermal alteration (medium) - Change in water temperature due to climate change. The 1998 El Nino and La Nina events resulted in significantly elevated water temperatures in some of the lakes which was suspected to have caused the disappearance the medusa stage of the *Mastigias sp.* jellyfish.
- Habitat disturbance (low) - Short term events that temporarily disrupt natural processes, behaviors or events. Such disruptions include increased noise levels from human activity, boat noise, etc.
- Species disturbance (low) - The increased physical contact between the jellyfish and humans in the marine lakes which may be stressing the jellyfish and altering their behavior.
- Alteration of water quality (low) - Suspected degradation of water quality in terms of salinity and chemical composition due to sunscreen use, visitors urinating in the enclosed lake, the lakes' slow water flushing rate, and suspected climate change effects.
- Jellyfish population decline (low) - Decrease in jellyfish populations due to some small scale harvesting for a small commercial market (Asian tourists), and research. There was a decline suspected to be due to the effects of climate change through thermal alteration. Decline is expected to be moderate based on historical observation.
- Fish population decline (low) - Gobi, rabbit fish, and surgeon fish are harvested on a subsistence level in a few lakes that are relatively accessible. Overall, the level of harvesting is very low due to the inaccessibility of marine lakes.
- Mangrove loss (low) - Refers to the selective harvest of mangroves species for timber which is a traditional practice. There is currently a ban on harvesting of mangroves that are located in the management area. In addition, mangroves contained in the enclosed marine lakes are too difficult to access. The extent of harvesting is assumed to be very localized based on the ban currently in effect but also based on the limited accessibility of mangrove areas within enclosed marine lakes

ii) Limestone Forest Systems

This target includes the limestone forests that densely cover most of the Rock Islands, which are uplifted coral reefs. The target was selected due to the islands containing some of the large and undisturbed stands of limestone forests, the endemic flora and fauna, and the economic value through tourism and as a reserve of forestry species. Nested under this target are the flora, including an unknown number of endemic species, several endemic bird species (including the endangered nicobar pigeon and blue-faced parrot finch), the Micronesian megapode, mammals (including bats and rats), reptiles and amphibians, coconut and land crabs. Currently, the health of the limestone forest system is considered "Very Good".

The stresses are:

- Crustacean/shellfish population decline (high) - Decrease in the population of land crabs and coconut crabs harvested from the island systems.
- Terrestrial species population decline (medium) - The suspected decrease in the populations of fruit bats, Nicobar pigeon, Micronesian megapode, Micronesian pigeon, and two species of endemic palm.
- Beach alteration (medium) - The change in the physical structure and function of the beach due to natural and anthropogenic induced events, including the introduction of alien/invasive species (e.g. *Casuarina sp.*).
- Altered composition/structure (medium) - The alteration of terrestrial habitat and landscape due to the presence of invasive species and human activity.
- Habitat disturbance (low) - The short-term events that temporarily disrupt the targets, such as human visitation.

iii) Mangrove Systems

Under this target only the mangrove systems along the coastlines and in the semi-enclosed lakes and bays are included (Maragos, *et al.*, 1994, estimate there are 1.6 km² of mangroves in Koror State). The smaller stands of mangroves that occur within the marine lake systems are covered by that target system. The mangrove system has been selected as a target due to the increasing clearing and degradation of mangroves that is occurring adjacent to the urban areas, and due to their importance in

shoreline protection, as a buffer and sediment traps (protecting the coral reef and seagrass systems), and as biologically extremely productive areas (key nursery areas for many marine resources). Nested under this target are the mangrove flora, several bird species, reptiles (including the saltwater crocodile), fish species (including a range of reef species that use the mangroves as nursery areas), mangrove crabs, and clams. The mangrove ecosystem is currently rated as "Fair," in terms of overall integrity.

The stresses are:

- Crustacean/Shellfish population decline (high) - Decrease in the population of mangrove crabs and molluscs, due to unregulated harvesting.
- Habitat degradation (medium) - The reduced functionality of the mangrove as a nursery, siltation and sedimentation buffer. Only the mangroves proximal to development areas are exposed to degradation effects.
- Toxins/contaminants (medium) - Point source and non-point source pollution in the form of oil, gasoline, chemicals, solid waste, terrestrial runoff, and raw sewage disposal.
- Modification of natural flow patterns (medium) - The disruption of natural water flow to mangroves due to development, cutting off fresh and/or salt water flow to mangroves which can cause complete loss.
- Sedimentation (medium) - An increase in the sediment load from degraded terrestrial systems.
- Habitat loss (low) - Actual loss of mangrove areas through clearing, reclamation and dredging activities for construction of infrastructure.
- Habitat disturbance (low) - Short-term or temporary disruption of natural behaviors, functions in mangroves.

iv) Seagrass Systems

The seagrass system includes the extensive seagrass beds that tend to occur on the inner half of reef flats in the protected lagoon environments, and on some of the more exposed reef flats with favorable current and nutrient regimes. There is no information available on the extent of seagrass areas in Koror State. This target was selected due to their importance in providing habitat for many subsistence and commercially important species, as food for a number of endangered species, and also due to an almost complete lack of information on these areas. Nested under this target are the seagrass species which are essential food for the endangered dugong and green sea turtle, as well as primary habitat for many reef fish and juvenile fish, including the sought-after rabbitfish, mullet, rudderfish and goat fishes (Maragos, *et al.*, 1994). Also included are subsistence and commercially important species of sea urchins and sea cucumbers, crustaceans and molluscs. The integrity of the seagrass system as a whole is considered "Good".

The stresses are:

- Habitat loss (medium) - The actual physical loss of seagrass beds through dredging for development.
- Habitat degradation (medium) - The severely reduced functionality of the seagrass beds as a nursery, foraging and grow-out habitat for fish species, dugongs and turtles.
- Fish population decline (medium) - The decline in fish species due to increasing commercial and subsistence fishing, and in some areas due to the loss of habitat.
- Invertebrate population decline (medium) - The decline in sea urchins, sea cucumbers and mollusc species due to increasing commercial and subsistence harvesting, and in some areas due to the loss of habitat.
- Habitat disturbance (medium) - Temporary interruption or disruption of natural processes and behaviors within the seagrass bed system.
- Sedimentation (low) - Increase in sediment load from degraded terrestrial systems.

v) Coral Reef Systems

The coral reef system forms the largest target. It includes fringing reefs (19.2 km²), barrier reefs (100 km², both inner and outer reefs); reef passes (both passes and false passes or dead-end channels), and patch reefs within the lagoon (approximately 683) (Maragos, *et al.*, 1994). This target was selected as the coral reef systems are the most significant ecosystems within the area, providing shoreline

protection from storms and heavy wave action, habitat for marine resources of commercial subsistence and cultural value, and form the primary attraction for international divers that constitute the vast majority of Palau's tourists. Nested under this target are the hard and soft coral species and the highly biodiverse range of other fauna and flora that constitute the exceptionally high biodiversity and aesthetic values of the system, also the economically important species (food and aquarium fish, trochus, lobsters (crayfish), giant clams, other invertebrates, and reef sharks. Also included are the reef fish spawning aggregation sites at reef passes, promontories and edges. Currently, the health of the Coral Reef.

The stresses are:

- Coral mortality (high) - The die-off coral colonies resulting in large areas of the reef communities being affected. The 1998 ENSO event (especially the La Nina) caused a significant rise in seawater temperature for an extended time, which resulted in high coral mortality - overall around 30-35% Palau wide, but up to 100% mortality in some areas.
- Habitat degradation (medium) - The impaired function of coral reefs systems as habitat for fish and invertebrates.
- Fish population decline (medium) - The decrease in the number and size of reef dwelling fish.
- Alteration of water quality (medium) - The changes in water chemistry through pollution, resulting in the degradation or impairment of the coral reef communities.
- Invertebrate population decline (medium) - The decrease in the population size of invertebrate marine resources due to subsistence and a small-scale commercial harvest of crayfish, molluscs, with a specific focus on the giant clam species (*Tridacna* and *Hippopus* spp.) that are specifically targeted for meat.
- Habitat loss (low) - Complete decimation of coral reefs and therefore, their function as habitat for numerous fish and invertebrate species.
- Habitat disturbance (low) - Short-term or temporary disruption of natural behaviors, functions in coral reefs, e.g. due to recreational and other (i.e. fishing and other water sports) activities.
- Sedimentation (low) - Increase in sediment load due to degradation of terrestrial systems. Mainly limited to coastlines attached to main islands of Koror.

vi) Large Reef Food Fish

The Large Reef Food Fish target includes the larger food fish species that are of commercial and subsistence value. The target excludes the pelagic and epipelagic species associated with the outer reef and lagoon areas, and excludes reef sharks. This target includes the larger groupers (Serranidae, especially the larger Epinephelinae - groupers and coral groupers), large wrasse (Labridae, especially *Cheilinus undulatus* - humphead wrasse), large parrotfish (Scaridae, especially *Bolbometopon muricatum* - humphead parrotfish), snappers (Lutjanidae), and emperors (Lethrinidae). This target was selected due to the importance of these large reef food fishes to the commercial (fishing and tourism) and subsistence economies of Palau, and the perceived population decline in recent years. The Large Reef Food Fish system is currently considered to have "Fair" health.

The four stresses are:

- Fish population decline (high) - The reduction of the population sizes of these key species due to over-exploitation.
- Change in population structure (high) - The change in the size distribution within a species population through selective over-exploitation of certain size classes.
- Species disturbance (medium) - The disruption of behavioral patterns and ecological factors due to anthropogenic activities.
- Habitat degradation (low) - The damage to the primary habitat of these reef fish species due to anchoring, diving, etc., with a particular focus on spawning aggregation sites.

vii) Turtles

Two species of sea turtles are included within this target, the green turtle (*Chelonia mydas*) and the hawksbill turtle (*Eretmochelys imbricata*), as there are both resident and nesting populations in Palau.

The other turtles species are only sighted rarely, including the loggerhead, olive ridley and the leatherback. Nested under this target are the foraging and nesting habitats. This target was selected as the hawksbill is threatened with extinction throughout its range, and the green turtle is listed by IUCN as endangered worldwide. The Rock Islands are an important nesting area for hawksbill turtles. Turtles play a significant role in the Palauan culture. The health of the sea turtle target is currently rated “Poor”.

The stresses are:

- Species disturbance (high) - The disruption of behavioral patterns due to anthropogenic activities.
- Turtle population decline (high) - The decrease in the numbers of turtles seen both in the water and nesting.
- Change in population structure (high) - A decrease in the perceived sizes of turtles within Palauan waters.
- Habitat degradation (medium) - The decline in the quality of nesting and foraging habitat.

viii) Beaches and Cays

This target includes the beaches and cays that are exposed at mean high tide, and includes the adjacent sub-tidal areas. They were selected due to their importance as turtle and seabird nesting areas. The ecological integrity of this system is currently rated “Good”.

The stresses are:

- Habitat degradation (medium) - The decline in the quality of the nesting habitat.
- Altered composition/structure (medium) - The physical changes in the habitat due to natural (e.g. typhoons, climate changes) and anthropogenic (e.g. development on the beaches).

During the SCP workshops, situation diagrams were used to assist in the identification of stresses and the source of stress and also provided a simple way of presenting the information visually. Examples of these diagrams are included in Appendix 2.

2.2.2. Integrity of Biodiversity Targets

The ecological health or “integrity” of the biodiversity targets was ranked based on the distribution of the target in the Management Area (landscape context), the condition of target, and its size. Refer to the 5-S-Framework for site conservation: A practitioners handbook for site conservation planning and conservation success” for a detailed explanation of the ranking process. The integrity ranks for the biodiversity targets in the Management Area are listed in Table 1.

Table 1: Integrity ranks for biodiversity targets.

Biodiversity Targets	Landscape Context	Condition	Size	Integrity Rank
	Grade	Grade	Grade	
Marine Lake Ecosystem	Good	Good	Good	Good
Limestone Forests	Very Good	Good	Very Good	Very Good
Mangrove Systems	Fair	Fair	Fair	Fair
Seagrass Systems	Good	Fair	Fair	Fair
Coral Reef Systems	Good	Fair	Good	Good
Large Reef Food Fish	Good	Fair	Fair	Fair
Turtles	Fair	Poor	Poor	Poor
Beach and Cay Ecosystems	Good	Fair	Good	Good
Site Biodiversity Health Rank				Fair

2.2.3 Biodiversity Threat Analysis and Stakeholders

A “threat” is a combination of the “stress” and the “source” of that stress for each target or system. “Critical threats” are those that have ranked the highest, and where the initial management focus should be.

The top 5 critical threats for the Rock Islands - Southern Lagoon area were identified as:

1. Commercial harvesting
2. Subsistence harvesting
3. Climate change
4. External harvesting
5. Recreational Activities

The 10 remaining threats are:

6. Infrastructure construction and development
7. Boat traffic
8. Invasive/alien species
9. Sand mining
10. Liquid/Solid waste
11. Ship groundings
12. Increase erosion
13. Timber harvesting
14. Boat trails
15. Net-kesokes

These rankings are shown in Table 2 below. Tables for stresses and sources of stress for each biodiversity target or system are presented in Appendix 1.

Table 2. Biodiversity targets threat analysis.

Active Threats Across Systems		Marine Lake Ecosystem	Limestone Forests	Mangrove Systems	Seagrass Systems	Coral Reef Systems	Large Reef Food Fish	Turtles	Beach and Cay Ecosystems	Overall Threat Rank	Total Score
1	Subsistence harvesting	Low	Low	Medium	High	Medium	Medium	High	-	High	2.63
2	Commercial harvesting	-	Low	High	Medium	Medium	Medium	High	-	High	2.62
3	Climate change	Medium	Low	-	-	High	-	-	Low	Medium	1.23
4	External harvesting	-	-	-	-	-	-	High	-	Medium	1.00
5	Recreational activities	Low	Low	-	-	Medium	Low	Medium	Low	Medium	0.52
6	Infrastructure construction and development	-	Low	Medium	Medium	Low	-	Low	-	Medium	0.49
7	Boat traffic	-	-	-	Medium	Low	Low	Medium	Low	Medium	0.49
8	Invasive/alien species	-	Medium	-	-	-	-	Low	Medium	Medium	0.43
9	Sand mining	-	Low	-	Medium	-	-	-	Low	Low	0.26
10	Liquid/Solid waste	-	-	Medium	-	Low	-	-	-	Low	0.23
11	Ship groundings	-	-	-	-	Medium	-	-	-	Low	0.20
12	Increase erosion	-	-	-	-	-	-	-	Medium	Low	0.20
13	Timber harvesting	Low	-	-	-	-	-	-	-	Low	0.03
14	Boat trails	-	-	Low	-	-	-	-	-	Low	0.03
15	Net-kesokes	-	-	-	Low	-	-	-	-	Low	0.03
Threat Status for Targets and Site		Low	Low	Medium	Medium	Medium	Medium	High	Medium	High	

Stakeholders

“Stakeholders” are the individuals, groups and institutions that impact the management targets, stresses, sources, strategies and ultimately management success- both in a positive way and negatively. This includes the human context- that is social, cultural, political, and economic constraints and opportunities presented by local stakeholders and the potential for their participation. The identification of stakeholders is an essential part of the planning framework. The key stakeholders whose activities either cause of influence the 5 critical threats to biodiversity targets are outlined below.

i) Commercial Harvesting

Commercial harvesting includes the harvesting or extraction of fauna or flora specifically for the purposes of selling them or their products on either the local or international markets. It includes sales in both the formal and informal markets.

The major stakeholders were identified for both the commercial and the subsistence harvesting, as in many cases they were the same groups. For each system they are:

- **Terrestrial systems:** Hunters supplying the local demand from both the informal market (for banned species) and to a lesser extent the local stores and restaurants. The demand comes in part from customary/traditional obligations, and the also the desire to eat delicacies or 'exotic' species (especially tourists). The hunters harvest to earn extra cash, as well as for some there is a recreational value, and it also has some status value. The other stakeholders include those responsible for control: the national government, Koror State government, and the traditional leadership.
- **Coral reef systems, large reef food fish, and seagrass systems:** The primary stakeholders for these two targets are essentially the same. Most fishers are involved both commercially and for subsistence, selling some of their catch and keeping some. There are, however, some fishers that focus primarily of commercial fishing, mostly for the local food fish market, but there is also one operation targeting aquarium fish species for the overseas market. The other stakeholders include those responsible for control: the national government, Koror State government, and the traditional leadership.
- **Turtles:** Adult green turtles are harvested for their meat. The hawksbill turtles are primarily harvested for their shell (for traditional items, and for jewelry for sale to tourists), and secondarily for meat. The eggs of both species are illegally taken for food. A few men deliberately target turtles, however, most take is more opportunistic. The harvest is driven by the desire for extra money (greed and informal market), some status for the hunters, traditional obligations, and the desire to eat turtle meat as a delicacy.

ii) Subsistence Harvesting

Subsistence harvesting includes the harvesting or extraction of fauna or flora specifically for local consumption only and not for the purposes of sale. As noted above, the preliminary stakeholder analyses that were undertaken for selected targets combined both the commercial and subsistence stakeholder together as in most cases they were the same groups.

iii) Climate Change

Climate change has been identified as a critical threat due to the impacts from the 1998 ENSO event that resulted in significant bleaching of corals throughout Palau. While not yet fully known or understood, the planning team assumed that in the next 10 years there will probably be increasing effects from climate change and possibly global warming, such as changes in sea surface temperature, weather patterns, tidal patterns and climatic regimes. From the 1998 experience this threat can result in major impacts to the management area, such as coral bleaching, and coastal and beach erosion.

iv) External Harvesting

This threat refers specifically to the external (i.e. outside of both the Rock Islands - Southern Lagoon management area and the country) harvesting of turtles. It ranked as a critical threat as turtles were the only target with a "poor" viability rating. While there are specific actions that can be undertaken to address most threats facing turtles, the control of harvesting outside of Palau will require significant investments of time and money and international and regional cooperation.

v) Recreational Activities

The Management Area is the foundation of Palau's tourism industry and is also an important recreational and relaxation spot for Palau's residents. Increasing numbers of visitors and types of recreational activities have led to safety, congestion and environmental concerns. The objective of management activities are: to provide suitable sites and basic infrastructure to support high quality tourism experiences in the Management Area that have minimal environmental impact and meet visitor expectations; maintain access to the Rock Islands for nature-based recreation by local residents that has minimal environmental impact and supports cultural values; ensure sufficient financial return from tourism activities in the Management Area for sustainable management; and to strengthen the relationship between Koror State Government and Tour-operators.

2.3 Stakeholder Consultations

Overview

Stakeholder consultations were conducted from December 2002 - July 2003 to accompany the Conservation Area Planning approach. The aim of the consultations was to identify any socio-economic aspects that may have been overlooked by the CAP tool, as well as identify any areas of conflict with biodiversity values. More importantly, consultations enabled stakeholders to actively participate in the planning process.

The consultations followed on from the initial community consultations conducted by PCS in 1998. Question topics were expanded to include what stakeholders valued about the Management Area, identify specific problems in the Management Area, and receive suggestions on what should be done about these problems. Additional consultations were conducted regarding subsistence fishing activities by PCS in 2004. The survey findings are presented in the PCS subsistence survey 2004 (Appendix 3). Community Centered Conservation (C3) also conducted tourism related consultations as part of their threat assessment of dive sites in Koror State and the development of a Marine Tour-Guide Training Manual (Appendix 3). The Office of Environmental Response and Coordination (OERC) conducted consultations in Koror State as part of the development of National Biodiversity Strategy and Action Plan (NBSAP) in 2003. The sections pertaining to Koror State are included in Appendix 3.

Methods

The Rock Islands Coordinator, Coastal Management Officer and Director interviewed a broad range of stakeholders who utilize the Management Area (Table 3). Stakeholders were divided into several key groups:

- Fishers (includes all types of harvesting)
- Boaters
- Tourism industry (tour-operators and tour-guides)
- Community Groups (women's group, men's groups)
- Government agencies including technical working group

The type of consultations varied from one-on-one interviews, to small group discussions and formal presentations. Interview details and a summary of the main findings are presented in Appendix 3. The results of the stakeholder consultations were compared to the surveys of PCS, C3 and OERC, to identify any new findings and potential areas of conflict.

Results

The results of the stakeholder consultations generally supported the biodiversity targets and threats identified using TNC's conservation area planning approach. It was clear that the Management Area was not only economically important to stakeholders (many depend on the area for their livelihood), but was also valued for its traditional significance, aesthetic beauty and recreational values. There was also a consensus amongst stakeholders to maintain the natural beauty of the Rock Islands and to prevent further development. These findings are reflected in the vision for the Management Area:

“To maintain the spectacular beauty and the abundant and diverse natural and cultural resources of the Rock Islands Southern Lagoon Area so that it can continue to be used and enjoyed by current and future generations of the people of Koror and Palau, and remain a central part of our culture and lifestyle.”

The consultations findings were also used to develop a broad management goal “To provide for the sustainable use and conservation of the natural resources of the Management Area”, and 4 key management objectives (biological diversity, traditional values, subsistence and commercial fishing, tourism and recreational activities) presented in Volume 1. Where possible, specific management recommendations were incorporated into the management actions and management zones outlined in Volume 1.

Table 3. Summary of stakeholder consultations and meeting dates.

Meeting date	Stakeholder group	Dept./company / group
HARVESTING/ CULTURE		
Feb 19 2003	Recreational fishing	Ngarrard State Govt.
Feb 19 2003	Recreational fishing	Individual
Feb 18 2003	Harvesting/culture/community	Individual
	Harvesting/culture/community	Individual
	Harvesting/culture/community	Individual
Feb 18 2003	Recreational fishing	PMA
Feb 20 2003	Commercial/recreational fishing	Fisherman
		Fisherman
Feb 25 2003	Community issues/harvesting	Head Start
Aug 19 2003	Subs/com/rec fishing	Fisherman
Aug 29 2003	Community issues/harvesting	Echang community meeting
Sep 04 2003	Subs/com/rec fishing	Fisherman
Mar 21 2004	Harvesting/ culture/community	Maiberel Women's Group
TOURISM		
Dec 03 2002	Tourism	PVA
Dec 03 2003	Tourism	PVA
Apr 28 2003	Tourism	Planet Blue
Jun 10 2003	Tourism	Sam's Tours/ BTA
Jun 16 2003	Tourism	Fish n' Fins dive shop
Jun 16 2003	Tourism	Neco Yamaha
Jun 17 2003	Tourism	Sam's Tours
Jun 17 2003	Tourism (Tiawanese)	PAIR
		PPC (power passion club)
Jun 23 2003	Tourism (Japanese)	IMPAC
Jul 01 2003	Tourism (Tiawanese)	Palau International Tour
Jun 25 2003	Tourism (live aboard)	Palau Agressor II
Jun 27 2003	Tourism	BTA
Jul 05 2003	Tourism (Japanese)	Rock Island Tour Company
		Rock Island Tour Company
Jul 02 2003	Tourism (Japanese)	Blue Marlin
Jul 08 2003	Tourism	Neco Dive Shop
Informal disc.	Tourism	Sam's Tours
Informal disc.	Tourism	Dive Palau
GOVERNMENT AGENCIES		
Dec 03 2002	State Govt.	KS cultural affairs
May 13 2003	National Government	MCPA Office of marine resources
	National Government	MCPA Office of marine resources
	National Government	MCPA Office of marine resources
Jul 03 2003	Tech committee/nat govt.	EQBP
Jul 03 2003	Tech committee	TNC
Jul 04 2003	Tech committee	PICRC
Jul 07 2003	National Government	Marine Resources
Jul 10 2003	Tech committee	PICRC/ node co-ordinator
Jul 14 2003	Tech committee/nat govt.	OERC
SCIENTISTS		
Jul 30 2003	Independent researcher	PICRC/ Dalhousie University, Canada
Jul 31 2003	Tech committee/ research	PICRC
Jul 31 2003	Tech committee/ research	PICRC
Jul 31 2003	Tech committee/ research	PICRC
Jul 31 2003	Tech committee/ research	CRRF
Jul 31 2003	Tech committee/ research	CRRF
Jul 31 2003	Tech committee/ research	OERC/ PCC (on sabbatical)

Chapter 3: Analysis & Refinement of Management Issues

The biodiversity targets and stresses, sources of stress and threat rankings outlined in Chapter 2.2 were organized into 10 key management issues:

- Harvest of fish
- Harvest of invertebrates
- Declining turtle populations
- Endangered dugongs
- Forst/terrestrial issues
- Climate change
- Tourism and other recreational activities
- Infrastructure, construction and development
- Boating
- Control of invasive speices and species outbreaks

These key management issues include the highest ranked threats (eg. harvesting, climate change) as well as vulnerable conservation targets (eg. dugong and turtles). Management issues are often combinations of a threat and target (eg. harvest of fish). The 10 broad issues incorporate all 15 biodiversity threats and 8 biodiversity targets ranked in the CAP tool. Broad management issues were used to minimize repetitiveness in the Management Plan - as there was much overlap between the threats and targets.

Short and long term management objectives (i.e. the desired outcome) for each management issue were developed from biological and social information collected through the CAP and consultation process.

Management actions to achieve these objectives were grouped into 4 categories:

1. Review, modification and development of regulations,
2. Enforcement of regulations,
3. Education and awareness, &
4. Research and monitoring.

Management actions were developed using biological information and the expertise of the planning team and were reinforced by recommendations from stakeholders. Stakeholder consultation provided a valuable tool in identifying gaps or conflicts in the management plan and also increased environmental awareness among stakeholders.

Chapter 4: Koror State Environmental Legislation

Tourist designated, zoned activity areas, protected areas and existing regulations are summarized in the Koror State fact sheet included at the end of this Chapter. Below is a summary of the Koror State Environment Laws, prepared by the Koror State Attorney (Greg Fullem).

Koror Municipal Ordinance No. 48-69 (Amending in its entirety Koror Municipal Ordinance No. 4-57, which covered various other reefs than as named in the 1969 law)

This municipal ordinance, effective as of June 16, 1969, set aside the following Koror State reefs as trochus breeding sanctuaries: 1) Uchelbeluu; 2) Ngederrak; 3) Lukes; 4) Udel; 5) Ngermongind; 6) Rebotel . The ordinance provides that except unless expressly permitted by the "Mayor of Koror Municipality with the concurrence of the Trust Territory Marine Biologist" the harvesting of trochus in the referenced areas at any time shall be illegal and constitute a misdemeanor offense and provides a monetary penalty for those taking trochus from the sanctuaries or entering the sanctuaries with the intent of removing trochus therefrom equal to not more than \$25.00 or imprisonment for not more than thirty (30) days, or both.

Koror Municipal Ordinance No. 49-69

This municipal ordinance, effective as of December 3, 1969, makes it unlawful for any person to take or collect shells within the waters of Koror State without first obtaining a written permit from the Mayor or his designated representative. The ordinance does not apply to the taking of shells for scientific purposes or for food. The ordinance also deems any violation of the law a misdemeanor and provides a penalty for violators of the law of a fine of not more than \$25.00 or imprisonment for not more than thirty (30) days, or both.

Koror Municipal Ordinance No. 50-69

This municipal ordinance, effective as of December 3, 1969, prohibits any professional photographer who is not a permanent resident of Koror State from taking photographs or movies in Koror State for commercial purposes unless the person first obtains a \$50.00 permit to do so from the Mayor or his designated representative. The ordinance also deems any violation of the law a misdemeanor and provides a penalty for violators of the law of a fine of not more than \$25.00 or imprisonment for not more than one month, or both.

Decree by Ngarameketii Chiefs Council of Koror dated December 19, 1973

This decree by the Ngarameketii Chiefs Council of Koror states that the following restrictions are to be observed from January 1, 1974, until such time as rescinded by additional tribal decree: 1) No persons who are not residents of Koror Municipality may fish or take, or cut, take away or hunt any terrestrial or marine life in the rock islands or there surrounding waters, or take away any article of value from within the Koror Municipality; 2) No pets such as cats, dogs or monkeys may be taken to the rock islands nor disposed of there at any time; and 3) All residents of Koror fishing or picnicking in the Rock Islands shall carefully observe Koror traditional and cultural methods and regulations pertaining to the use of the rock islands and surrounding waters. Any persons violating the decree shall be "punished by the Ngarameketii Chiefs Council of Koror in accordance with traditional and cultural manners." This law has not been officially rescinded in writing by additional tribal decree.

Koror State Public Law No. K2-34-89

This Koror State Public Law, effective as of May 11, 1989, prohibits littering or deposit of waste material by any person on any land or in any waters or atmosphere owned, controlled by, under the jurisdiction of, or maintained by the State of Koror except in a public dumping ground. This includes a ban on all trucks and other vehicles from allowing soil, sand, coral, rocks, vegetation or other materials to be blown from the vehicle while either moving or stationary. Persons violating the littering prohibition are liable for civil penalties in the amount of \$200 per violation and forfeiture of the vehicle (and all related equipment) used in the act. Additionally, the violator shall be guilty of a misdemeanor and punished by incarceration of at least thirty (30) but not to exceed ninety (90) days

and a fine of at least fifty dollars (\$50.00), but not to exceed one hundred dollars (\$100.00), and shall also be liable for reasonable costs and fees (including clean-up and attorney costs) incurred by Koror State in enforcing the law.

Koror State Public Law No. K3-54-92

This Koror State Public Law, effective as of October 20, 1992, provides practices for the proper care, removal, and disposal of wrecked, stranded, or abandoned ocean going vessels and their contents and places the burden of such practices upon the persons responsible for the wreckage, stranding or abandonment of the vessel or upon the operator or owner thereof. Under this provisions of this Act the Koror State Marine Rangers are to remove salvageable materials from the wreck, secure the wreck with anchors, oversee the removal of all hazardous substances therefrom and the removal or disposal of the wreck if not moved by the owner within one (1) month of its grounding. Notwithstanding the duties of the Rangers set forth, the owners are required to remove the vessels themselves, according to strict requirements set forth in the Act. All costs incurred by the Rangers or the State of Koror in accomplishing the obligations of ship owners shall be jointly and severally paid by the operator, and/or owner of the vessel including (without limitation): (a) costs for fuel, oil and other transportation costs; (b) employee costs; (c) costs of all equipment required for removal; (d) costs of hiring experts and special equipment; and (e) costs of all materials used for storage and clean-up. Violators of the Act are liable to pay a fine of no less than \$1,000 and no more than \$10,000 for each separate offense. Each day of a violation constitutes a separate offense. The House of Traditional Leaders of the State of Koror may waive any provision of the Act.

Koror State Public Law No. K4-64-94

This Koror State Law, effective as of October 12, 1994, establishes a Port Commission consisting of five (5) members that are charged with conducting an annual study and review of the facilities and operation of the Port of Koror which will evaluate (a) proposals for improvements to, or expansion of, the facilities and operations thereof, and (b) whether or not the Legislature should establish tariffs, maximum rates or charges on tenants of the Port. The Commission is also charged with submitting comments upon any lease or renewal thereof with respect to land leased in the Port area.

Koror State Public Law No. K4-68-95 (which amends in its entirety Koror State Public Law No. K3-42-90, effective as of January 10, 1990, requiring that licenses be required for all commercial fishing in Koror State waters)

This Koror State Public Law, effective as of approximately June 13, 1995, requires that licenses be required for all commercial fishing in Koror State waters and that different licenses be obtained for each classification of fishing (i.e. clamming, shelling, lobstering, netting, spearing, trolling, bottom line fishing, or long line fishing). Licenses are required to fill out detailed applications and then the Governor (or designee) is to review and evaluate the application and issue a license only when it is determined that the issuance will not unduly deplete, endanger or harm the resources of Koror State. The law also provides the following monthly fees for respective fishing licenses: (a) for spear gun, line or hook (including long line, bottom line, reel casting or trolling, but excluding fishing for lobster, crab or other crustaceans), \$25.00; (b) for lobster, land crab or other crustaceans or shellfish, \$10.00; (c) for sea cucumber, kelp, seaweed and clams, \$10.00; and for reef fishing with nets, \$10.00. For non-commercial fishing by non-Palauan citizens, the annual fee is \$100.00, or \$10.00 per month, excluding net fishing, which costs \$50.00 per month. With respect to fish sales, this law prohibits all persons or entities from purchasing fish unless the seller exhibits to the buyers his/her license, and all buyers are required to provide written numbered receipts to sellers. Both sellers and buyers are required to maintain records of each transaction for official inspection. The following activities, among others, are also prohibited under this law: (1) spearfishing with a spear or projectile powered by compressed gas or by any other explosive mechanism; (2) fishing with the assistance of any explosive substance or any harmful substance or poison; (3) fishing using any net with mesh "smaller than three inches on any side of the hole"; (4) commercial fishing "within the reef by foreign licensee or any company with foreign partnership or joint venture"; (5) drag and drift net fishing both inside and outside the reef except for the purpose of bait collection; (6) fishing using any net that is moved by any vessel; (7) fishing using any form of mechanically compressed air or other breathing apparatus; (8) receiving, buying,

transporting, storing, using, eating, or selling any fish obtained in violation of this law; (9) fishing of any nature within one mile of the shore line of either Ngemelis or Dmasch Island; (10) fishing for trochus at any time except during the trochus season mandated by the Republic of Palau, unless further restricted by Koror State; and (11) processing trochus in any area except the western pier of T-Dock from the gas station to the tip of the pier, the area of Ice-Box Park between the sewage treatment plant and the end of the road at BMDC, the filled land on the opposite side of the causeway from Ngetmeduch Island, or any other area identified by the Governor. Additionally, any violator shall be guilty of a misdemeanor and may be punished by incarceration not to exceed ninety (90) days and a fine of at least fifty dollars (\$50.00), but not to exceed one hundred dollars (\$100.00), and/or also be liable for civil penalties in the form of \$500.00 for the first violation and \$1,000 for each subsequent violation, and the forfeiture to Koror of all fish (or the fair market value thereof) obtained in violation of the Act, and all vehicles, boats, engines, scales, spears, nets, lines, tackle, and other equipment used to engage in fishing or receiving, selling, buying, transporting, storing, preparing or using of the fish obtained in violation of the Act. Violators shall also be liable for costs (including reasonable attorney costs) incurred by Koror State in enforcing the law.

Koror State Public Law No. K6-87-98 (as amended by Koror State Public Law No. K6-124-2001, effective as of approximately November 7, 2001, which, among other things, repealed Koror State Public Law No. K6-111-2000)

This Koror State Public Law, effective as of April 2, 1998, placed a ban on the erection, operation or maintenance of a floating hotel in any body of water of the State of Koror. There was also originally established a moratorium upon the operation of new live-aboard dive vessels within Koror State waters which was revised by the 2001 amendment to allow the operation of up to seven (7) live aboard dive vessels in Koror State waters while banning the operation of any new live aboard vessels not operating at the time of the 2001 amendment, calling for the promulgation of live aboard dive boat regulations by the Governor and providing for an annual environmental impact fee to be paid by all operators of such vessels. All live aboard vessels not "grand fathered" by the 2001 amendment are allowed to transit through Koror State waters for navigation or interstate or foreign commerce, but are only allowed to anchor at Malakal Harbor except during emergency situations or if specifically permitted to anchor elsewhere for scientific or educational research. Annual environmental impact fees to be paid to Koror State for legal live aboards are set at one thousand dollars (\$1,000.00) for vessels with five (5) to ten (10) cabins and two thousand dollars (\$2,000.00) for vessels with eleven (11) to thirty (30) cabins. All such fees are to be used by Koror State to maintain mooring buoys, conservation marker buoys and channel markers, to construct or otherwise create a system at the sea terminal to allow live-aboards to pump sewage and waste water directly into the sewer system or to construct a holding tank system, or to maintain any such system. The Bill also provided the following penalties for violations (including attempt and conspiracy) of its terms: (a) a fine in the amount of \$50.00 and a jail term of up to five (5) days, or both, for the first offense; (b) a fine in the amount of \$100.00 and a jail term of five (5) days for the second offense; and (c) a fine in the amount of \$100.00 and a jail term of ninety (90) days for the third and subsequent offenses. The law also states that any government employee who violates the law by processing an application or issuing a permit in violation of its terms will be charged. Also, the law provides for civil damages against violators and mandates that any citizen of Koror may bring a suit for damages against a violating party and be entitled to fifty percent (50%) of the total damages obtained against a violator at trial. Temporary regulations for legal live-aboards regarding anchorage, mooring, wastewater, oil and petroleum waste and solid waste disposal are also contained in the law. They have since been superseded and replaced by regulations promulgated by the Koror State Governor.

Koror State Public Law No. K6-95-99

This Koror State Public Law, effective as of April 28, 1999, prohibits the capture of *mekebud* (Gold Spotted Herring or *Kerklotsichthys quadrimaculatus*), *merau* (Blue Sprat or *Spratelloides delicatulus*), and *teber* (Hardthead Silverside or *Atherinomorus lacunosus*) in certain areas and during certain times of the year, to prohibit the taking or disturbance or marine flora and fauna in popular tourist sites and to prohibit the sale of *mekebud*. The law bans the taking, capturing, netting, catching, containment or removal (or any attempt or conspiracy to do the same) of the three species from within one hundred

(100) yards of the entrance to the Ngkisaol islands, including the shallow water area within the inlet. The law also bans the taking, capturing, netting, catching, containment or removal (or any attempt or conspiracy to do the same) of the three named fish species during the four days immediately preceding the full moon and on the day and night of the full moon in all the territorial waters of Koror State. Also contained in this law is a total ban on the capture, netting, containment, etc. of any species of flora or fauna, alive or dead, from: Soft Coral Arch, including any area within 100 yards thereof; Cemetery Reef, including any area within 100 yards of any upper edge thereof; any marine lake in Koror, meaning any body of water that is separated from the ocean by rocks, island, land barrier, or which is cut off from the ocean at low tide even if there is a tunnel or cave which links another part of the marine lake to ocean waters; and Ngkisaol Islet. Additionally, the law prohibits the sale of *mekebud* at all times in Koror. Any violator or person who attempts or conspires to violate the law shall be punished by incarceration of three (3) days or a fine of at least one hundred dollars (\$100.00) or both for the first offense, incarceration of five (5) days and a fine of one hundred dollars (\$100.00) for the second offense, and incarceration of up to ninety (90) days and a fine of at least one hundred dollars (\$100.00) for the third and subsequent offenses

Koror State Public Law No. K6-97-99

This Koror State Public Law, effective as of April 28, 1999, provides management procedures for the islands of Ngemelis - the four islands known as Dmasech, lilblau, Cheleu and Bailechesengel - by diverting motorized boats from the area in an effort to decrease erosion of the islands, protect fragile coral reefs from damage and maintain water clarity and quality. The law renders it unlawful for any person to operate any motor vessel between or through the referenced islands except for emergency purposes, for purposes of research and monitoring by written permit, for law enforcement or as otherwise permitted by law or permit. Additionally, any violator or person who attempts or conspires to violate the law shall be punished by incarceration of three (3) days or a fine of at least one hundred dollars (\$100.00) or both for the first offense, incarceration of five (5) days or a fine of at least one hundred dollars (\$100.00) or both for the second offense, and incarceration of up to ninety (90) days or a fine of at least one hundred dollars (\$100.00) or both for the third and subsequent offenses.

Koror State Public Law No. K6-99-99 (which amends and supersedes in its entirety Koror State Public Law No. K2-33-89, effective as of May 11, 1989, regarding boat inspection, registration and licensure in Koror State waters; and as amended by Koror State Public Law No. K6-105-99, which revised the size of the registration number to be displayed on motorboats)

This Koror State Public Law, effective as of July 14, 1999, and with a sunset date of ten (10) years thereafter, requires the owners of any class of motorboat to register by January 1 of each year and obtain a registration number for each boat after providing proof of a safety inspection certificate indicating compliance with national governmental regulations. The only owners regulated are those persons who have Koror as a principal place of residence. Motorboats covered are those with outboard engines and those not having outboard engines that are 25 feet or less in length. Owners, after filing the application described in the law and obtaining a registration number are required to affix the number on the forward part of the starboard and port sides of the boat, located as high as possible on such part of the boat as to be easily visible to observers. Prorated annual fees are as follows: \$2.50 per year for all boats that have a length less than 25 feet and an engine under 15 horsepower; \$5.00 per year for all boats that have a length less than 25 feet and an engine between 15 and 55 horsepower; \$7.50 per year for all boats that have a length less than 25 feet and an engine between 56 and 115 horsepower engines; \$10.00 per year for all boats that have a length less than 25 feet and an engine between 116 and 175 horsepower; \$12.50 per year for all boats that have a length less than 25 feet and an engine between 176 and 235 horsepower; \$15.00 per year for all boats that have a length less than 25 feet and an engine between 236 and 305 horsepower; \$17.50 per year for all boats that have a length less than 25 feet and an engine between 306 and 399 horsepower; \$20.00 per year for all boats that have a length less than 25 feet and an engine between 400 and 599 horsepower; and \$22.50 per year for all boats that have a length less than 25 feet and an engine over 600 horsepower, with an additional \$2.50 fee for each additional increment of 50 horsepower. Additionally: for boats longer than 25 feet utilizing at least one outboard engine one fee each shall be paid as follows for both the length and horsepower of the engine: (1) fee based on the size of boat, \$10.00 per year for boats that

are 25-39 (sic) feet in length, \$15.00 per year for boats that are 30-39 feet in length, \$20.00 per year for boats that are 40-49 (sic) feet in length, \$25.00 per year for boats that are 50 feet in length or more, with an additional \$2.50 fee for each additional foot exceeding 50 feet. The law contains a presumption that any motorboat being anchored, docked or moored in Koror for a period of ten (10) days is owned by a resident of Koror and must be registered. Additionally, any violator shall be punished by a fine of fifty (50) dollars (\$50.00) for the first offense, incarceration of three (3) days and/or a fine of at seventy-five dollars (\$75.00) for the second offense, and incarceration of ten (10) days and/or a fine of one hundred dollars (\$100.00) for the third offense, each violation to be deemed a separate offense. Fees collected are to pay for monitoring and enforcement of the law, including the purchase of boats, fuel and oil and maintenance and other expenses.

Koror State Public Law No. K6-101-99 (as amended by Koror State Public Law No. K6-118-2001, which redesignates the boundaries of the Conservation Area)

This Koror State Public Law, effective as of September 20, 1999, creates a sanctuary for the protection and preservation of the Ngerumekaol spawning area and to conserve the Ngerukewid Islands Wildlife Preserve. The act specifically describes the Ngerumekaol Conservation Area and renders it illegal to kill, trap, capture wound, possess, transport, retain or otherwise have under control any fish or part thereof in the defined area. Violators shall be guilty of a misdemeanor an imprisoned for a period not exceeding ninety (90) days or fined not more than fifty dollars (\$50.00) or both. The law also specifically describes the Ngerukewid Islands Wildlife Preserve, states that the area must be retained in its "present primitive condition where the natural plant an animal life shall be permitted to develop undisturbed," and prohibits all persons from transporting any firearms of any description or other weapons, nets, traps, snares or objects or materials capable of killing, or otherwise taking birds, animals or marine life or eggs or possessing the same in the Preserve. It also bans persons from transporting domestic birds or animals or allowing such animals under his control to enter the Preserve, lighting or using fire in the Preserve or cutting or destroying plant life in the Preserve or removing plant life therefrom. Additionally, any violator shall be guilty of a misdemeanor punished by a fine of fifty (50) dollars (\$50.00) or incarceration up to ninety (90) days or both.

Koror State Public Law No. K6-102-99

This Koror State Public Law, effective as of September 20, 1999, rezoned the area commonly known as Ngerur Island from CD (Conservation Zone) to RV (Resort Center Zone). Pursuant to the Koror Zoning law at 31 PNC § 3001 et seq., the only allowed uses under a CD Zone are parks, wilderness or shoreline preserves, flood and erosion prevention activities, and other conservation activities and accessory uses customarily incident to the above uses. The RV Zone allows for hotels, restaurants, nightclubs, bars and similar uses and accessory buildings and uses customarily incident thereto. This zone change occurred to accommodate a proposed luxury hotel resort to be situated on Ngerur.

Koror State Public Law No. K6-107-00

This Koror State Public Law, effective as of approximately January 3, 2000, requires that owners or operators of cruising yachts (defined as non-commercial pleasure boats that are not required to register under any boat registration act of the Republic of Palau or its states) obtain permits when such yachts anchor, moor or dock within the territorial waters of Koror State, excluding Malakal Harbor. The law sets forth the following monthly permit fees: \$10.00 for yachts with an overall length equal to or exceeding 16 feet but less than 23 feet; \$20.00 for yachts with an overall length equal to or exceeding 23 feet but less than 40 feet; \$40.00 for yachts with an overall length equal to or exceeding 40 feet but less than 65 feet; and \$80.00 for yachts with an overall length equal to or exceeding 65 feet. Permits are required to be available for inspection at all times. Additionally, any violator shall be guilty of a misdemeanor punished by a fine of not more than one hundred dollars (\$100.00) or incarceration up to ninety (90) days or both.

Koror State Public Law No. K6-110-00

This Koror State Public Law, effective as of approximately March 29, 2000, prohibits the cutting and/or harvesting of trees and vegetation below the high tide line, in mangroves and within wetlands areas, except those instances in which such measures are taken to maintain or expand existing *mesei*

(taro patches) or to create new *mesei* or when the state or national government performs such measures to benefit the public (i.e. for public roads or existing docks, power and sewer lines or sewage treatment centers). Additionally, any violator shall be punished by a fine of one-hundred dollars (\$100.00) and/or incarceration of up to three (3) days for the first offense, a fine of one-hundred dollars (\$100.00) and/or incarceration of up to ten (10) days for the second offense, and a fine of one-hundred dollars (\$100.00) and/or incarceration of up to thirty (30) days for the third offense, each violation to be deemed a separate offense.

Koror State Public Law No. K6-113-00 (which amends and supersedes in their entirety: Koror State Public Law No. K4-65-94 regarding dive permit legislation; Koror State Public Law No. K5-74-97 , the "Rock Island Use Act" ("RIUA"); Koror State Public Law No. K5-84-97, which established a sunset date for the RIUA; and Koror State Public Law No. K5-89-98, which renamed the RIUA the "Koror Rock Islands Management and Preservation Act")

This Koror State Public Law, effective as of approximately August 31, 2000, and titled the "Year 2000 Rock Islands Management and Conservation Act," consolidates prior laws pertaining to the recreational use of the Rock Islands (defined as all islands, including land and beaches, within the territorial jurisdiction of the State of Koror, but excluding Malakal, Arakebesang, Ngerur Island, Koror mainland and any other small islets or islands joined to Malakal, Arakebesang or Koror mainland by causeway or bridge) in an attempt to manage the Rock Islands and surrounding water resources. The law establishes the following "Tourist Activity Areas": the jellyfish lake on Macharchar Island, including the designated pathway thereupon; the island of Babelomekang; the island of Youlomekang; the beach area of Ngchelobel; the island of Ngeanges; the island of Mgermeaus; the island of Ngchus; Ngeremdiu and the Ngeremdiu Todai Trail (German Lighthouse); the islands of Ulong; the beach area of Ngeroblobang; and Bkulotuut. All portions of the Rock Islands except the Tourist Activity Areas are for the exclusive use of Palaun citizens and resident aliens (defined as any person who is not a Palauan citizen but resides in Palau). Tourists may not enter, visit, stay or remain on any Rock Island or portion thereof if it is not part of the Tourist Activity Area, and all citizens and resident aliens are prohibited from accompanying or transporting any tourist into any non-Tourist Activity Area. Tourist may use the waters of the State of Koror for diving, snorkeling, fishing and other recreational uses. However, tourists using the waters of Koror or visiting the designated tourist areas in the Rock Islands must purchase a Rock Island use permit and must have it in their possession while in the Rock Islands. The Rock Island use permit costs \$15.00, is valid for seven (7) days, is nontransferable and must be kept on the person of the tourist at all times. Tourists must also acquire a fishing permit, as required by law. It is unlawful for any boat operator to transport tourists using the waters of Koror for recreational purposes who are not in possession of a Rock Island use permit, however tourists, while in direct, non-stop transit through the waters of Koror State to a destination outside Koror State boundaries and who do not engage in the referenced activities are exempt. It is also unlawful for any boat operator to transport tourists without a Rock Island use permit to the designated tourist areas in the Rock Islands. Tour operators may be authorized by the Governor to sell permits to their customers after submitted a detailed application to the Governor for such right and privilege. Tour operators must maintain a detailed accounting with respect to permits sold, including the tourist's name and address, the serial number of the permit, the date of issuance and Koror State receipt number. Tour operators shall submit their accounts to the Koror State Finance Office within fifteen days after the end of each quarter, by April 15, July 15, October 15, and January 15. Tour operators are required to inform tourists of the restrictions of this act and must post a notice as specifically set forth in the act. Any attempt by a tour operator to prohibit, refuse or cause delay in allowing the Koror State Finance Office to audit the operator's records shall be a violation under the law; the right and privilege to sell permits may be revoked. The Paramount Chief Ibedul or his designee in the Koror State House of Traditional Leaders may exempt official guests from the requirements of this act in writing, upon application. Upon conviction, violators shall be guilty of a misdemeanor and pay a fine in the amount of \$50.00 for the first offense. For the second offense, violators shall pay a fine of \$75.00 and may be imprisoned for not more than three (3) days, and for a third or subsequent offense, violators shall pay a fine of \$100.00 and shall be imprisoned for not less than three (3) days and not more than ninety (90) days. The law also lists the purposes of the permit fees, and states that not less than fifty percent (50%) of the fees will be applied to the costs of various items, including (among other things) maintenance and protection of dive sites,

acquisition and installation of mooring buoys, monitoring purposes and other expenses associated with the protection and preservation of the Rock Islands. The law automatically terminates upon the passage of a Comprehensive Management Plan for the Rock Islands.

Koror State Public Law No. K6-119-2001

This Koror State Public Law, effective as of approximately January 10, 2001, enacts a moratorium upon fishing and taking of any marine flora or fauna on or in the reef area commonly known as "Ngaderrak" and prohibits motorized watercraft from traveling over the referenced reef area for a period of two years from and after the effective date. Any person violating the law can, upon conviction, be fined no less than fifty dollars (\$50.00) but no more than one hundred dollars (\$100.00) for a first offense and shall also be sentenced for a period of up to ninety (90) days for each offense. Each subsequent offense after the first offense shall be punished with "a greater monetary fine, and/or increased jail offense (sic). No offense shall be deemed a continuing offense and each individual item of flora or fauna taken or disturbed shall be deemed a separate offense that may be punished separately.

Koror State Public Law No. K6-121-2001

This Koror State Public Law, effective as of approximately July 8, 2001, mandates that any party, including all courts of competent jurisdiction, must recognize and include in any consideration, estimation or deliberation by any party regarding the monetary value of any and all unlawful damage to any portion of the coral reef ecosystem located in the waters of the State of Koror, direct use values, indirect use values and non-use values of the portion of the coral reef ecosystem damaged.

Appendix 1: Management Plan Background Documents (planning history)

- 1. PCS, 1997. Concept proposal: Rock Island Conservation Area Awareness and Concensus Building Project, submitted to SPBCP.**
- 2. PCS, 1998. Community Consultation Progress Report, submitted to SPREP.**
- 3. PCS, 1998. Four-year strategy for the Rock Islands Conservation Area, submitted to SPBCP.**
- 4. SPBCP, 2000. Rock Islands Conservation Area, Palau, Transition Strategy 2000-2002.**
- 5. Smith 2002. Discussion Paper: Strategy outline for the Development and Implementation of a Management Plan for the Rock Islands Area of Koror State, Palau.**

Appendix 2: Conservation Area Planning Material

- 1. TNC Site Conservation Planning Framework**
- 2. Site Conservation Planning (SCP) workshop 1 notes**
- 3. Situation diagrams**
- 4. Stress and source of stress worksheets**

4. Stresses and sources of stresses worksheets

Table 1. Stresses and Sources of Stress on the Marine Lakes system

Ecological Integrity Summary for this Target		Landscape Context	Condition	Size	Integrity Rank
1	Marine Lake Ecosystem	Good	Good	Good	Good

	Stresses	Severity	Scope	Stress
1	Habitat disturbance	Low	Low	Low
2	Species disturbance	Low	Low	Low
3	Alteration of water quality	Low	Low	Low
4	Thermal alteration	Medium	High	Medium
5	Fish population decline	Low	Low	Low
6	Jellyfish population decline	Medium	Low	Low
7	Mangrove loss	Low	Low	Low

Sources of Stress			Habitat disturbance	Species disturbance	Alteration of water quality	Thermal alteration	Fish population decline	Jellyfish population decline	Mangrove loss	-	Threat to System Rank
Marine Lake Ecosystem			Low	Low	Low	Medium	Low	Low	Low	-	
1	Recreational activities	Contribution	Medium	High	High						Low
		Irreversibility	Low	Low	Low						
		Override									
	Source	Low	Medium	Medium	-	-	-	-	-		
	Active Threat	Combined Rank	-	Low	Low	-	-	-	-	-	
2	Research activities	Contribution	Low	Low				Low			-
		Irreversibility	Low	Low				Low			
		Override									
	Source	Low	Low	-	-	-	Low	-	-		
	Active Threat	Combined Rank	-	-	-	-	-	-	-	-	
3	Commercial harvesting	Contribution						Low			-
		Irreversibility						Low			
		Override									
	Source	-	-	-	-	-	Low	-	-		
	Active Threat	Combined Rank	-	-	-	-	-	-	-	-	
4	Climate change	Contribution			Medium	Very High		Medium			Medium
		Irreversibility			Medium	Medium		Medium			
		Override									
	Source	-	-	Medium	High	-	Medium	-	-		
	Active Threat	Combined Rank	-	-	Low	Medium	-	Low	-	-	
5	Subsistence harvesting	Contribution							Very High		Low
		Irreversibility							Medium		
		Override									
	Source	-	-	-	-	-	-	High	-		
	Active Threat	Combined Rank	-	-	-	-	-	Low	-	-	
6	Timber harvesting	Contribution							Very High		Low
		Irreversibility							Medium		
		Override									
	Source	-	-	-	-	-	-	High	-		
	Active Threat	Combined Rank	-	-	-	-	-	Low	-	-	

Table 2. Stresses and Sources of Stress on Limestone Forest systems

Ecological Integrity Summary for this Target		Landscape Context	Condition	Size	Integrity Rank
2	Limestone Forests	Very Good	Good	Very Good	Very Good

	Stresses	Severity	Scope	Stress
1	Terrestrial species population decline	Medium	High	Medium
2	Crustacean/Shellfish population decline	High	High	High
3	Habitat disturbance	Low	Low	Low
4	Beach alteration	High	Medium	Medium
5	Altered composition/structure	Medium	High	Medium

Sources of Stress			Terrestrial species population decline	Crustacean/Shellfish population decline	Habitat disturbance	Beach alteration	Altered composition/structure	-	-	-	Threat to System Rank
Limestone Forests			Medium	Low	Low	Medium	Medium	-	-	-	
1	Commercial harvesting	Contribution	High	Very High							Low
		Irreversibility	Medium	Medium							
		Override									
	Source	Medium	High	-	-	-	-	-	-		
Active Threat		Combined Rank	Low	Low	-	-	-	-	-	-	
2	Subsistence harvesting	Contribution	High	High							Low
		Irreversibility	Medium	Medium							
		Override									
	Source	Medium	Medium	-	-	-	-	-	-		
Active Threat		Combined Rank	Low	Low	-	-	-	-	-	-	
3	Liquid/Solid waste	Contribution			Low						-
		Irreversibility			Medium						
		Override									
	Source	-	-	Low	-	-	-	-	-		
Active Threat		Combined Rank	-	-	-	-	-	-	-	-	
4	Invasive/alien species	Contribution	High			High	High				Medium
		Irreversibility	High			High	High				
		Override									
	Source	High	-	-	High	High	-	-	-		
Active Threat		Combined Rank	Medium	-	-	Medium	Medium	-	-	-	
5	Climate change	Contribution				High					Low
		Irreversibility				Low					
		Override									
	Source	-	-	-	Medium	-	-	-	-		
Active Threat		Combined Rank	-	-	-	Low	-	-	-	-	
6	Sand mining	Contribution			Low	Low					Low
		Irreversibility			Low	Medium					
		Override									
	Source	-	-	Low	Low	-	-	-	-		
Active Threat		Combined Rank	-	-	-	Low	-	-	-	-	
7	Recreational activities	Contribution			High	Low	Low				Low
		Irreversibility			High	Medium	Medium				
		Override									
	Source	-	-	High	Low	Low	-	-	-		
Active Threat		Combined Rank	-	-	Low	Low	Low	-	-	-	
8	Infrastructure construction and development	Contribution			Low		Low				Low
		Irreversibility			High		Medium				
		Override									
	Source	-	-	Medium	-	Low	-	-	-		
Active Threat		Combined Rank	-	-	Low	-	Low	-	-	-	

Table 3. Stresses and source of stress on Mangrove systems

Ecological Integrity Summary for this Target		Landscape Context	Condition	Size	Integrity Rank
3	Mangrove Systems	Fair	Fair	Fair	Fair

	Stresses	Severity	Scope	Stress
1	Habitat Loss	Medium	Low	Low
2	Habitat disturbance	Low	Medium	Low
3	Habitat degradation	Medium	Medium	Medium
4	Toxins/contaminants	Medium	High	Medium
5	Crustacean/Shellfish population decline	High	High	High
6	Modification of natural flow patterns	High	Medium	Medium
7	Sedimentation	High	Medium	Medium

Sources of Stress			Habitat Loss	Habitat disturbance	Habitat degradation	Toxins/contaminants	Crustacean/Shellfish population decline	Modification of natural flow patterns	Sedimentation	-	Threat to System Rank
Mangrove Systems			Low	Low	Medium	Medium	High	Medium	Medium	-	
1	Infrastructure construction and development	Contribution	Very High	Very High	Very High	Medium		Very High	Medium		Medium
		Irreversibility	Very High	Very High	Very High	Very High		High	Medium		
		Override									
	Source	Very High	Very High	Very High	High	-	Very High	Medium	-		
Active Threat		Combined Rank	Low	Low	Medium	Medium	-	Medium	Low	-	
2	Liquid/Solid waste	Contribution		Low	Medium	Very High					Medium
		Irreversibility		High	Very High	High					
		Override									
	Source	-	Medium	High	Very High	-	-	-	-		
Active Threat		Combined Rank	-	Low	Medium	Medium	-	-	-	-	
3	Boat trails	Contribution	Low	Medium	Medium	Low		Low			Low
		Irreversibility	High	Low	Low	Low		Medium			
		Override									
	Source	Medium	Low	Low	Low	-	Low	-	-		
Active Threat		Combined Rank	Low	-	Low	Low	-	Low	-	-	
4	Commercial harvesting	Contribution					Very High				High
		Irreversibility					Medium				
		Override									
	Source	-	-	-	-	High	-	-	-		
Active Threat		Combined Rank	-	-	-	-	High	-	-	-	
5	Subsistence harvesting	Contribution					Medium				Medium
		Irreversibility					Medium				
		Override									
	Source	-	-	-	-	Medium	-	-	-		
Active Threat		Combined Rank	-	-	-	-	Medium	-	-	-	

Table 4. Stresses and Sources of Stress on Seagrass systems

Ecological Integrity Summary for this Target		Landscape Context	Condition	Size	Integrity Rank
4	Seagrass Systems	Good	Fair	Fair	Fair

	Stresses	Severity	Scope	Stress
1	Habitat Loss	High	Medium	Medium
2	Habitat degradation	High	Medium	Medium
3	Habitat disturbance	High	Medium	Medium
4	Fish population decline	Medium	High	Medium
5	Invertebrate population decline	High	Medium	Medium
6	Sedimentation	Medium	Low	Low
7	Low dugong population	High	High	High

Sources of Stress			Habitat Loss	Habitat degradation	Habitat disturbance	Fish population decline	Invertebrate population decline	Sedimentation	Low dugong population	-	Threat to System Rank	
Seagrass Systems			Medium	Medium	Medium	Medium	Medium	Low	High	-		
1	Sand mining	Contribution	High	High	High			Low	Medium		Medium	
		Irreversibility	Very High	Medium	Medium			Medium	High			
		Override										
		Source	High	Medium	Medium	-	-	Low	Medium	-		
Active Threat		Combined Rank	Medium	Low	Low	-	-	-	Medium	-		
2	Infrastructure construction and development	Contribution	Very High	Very High	Very High			High	Medium		Medium	
		Irreversibility	Very High	Very High	Very High			Medium	High			
		Override										
		Source	Very High	Very High	Very High	-	-	Medium	Medium	-		
Active Threat		Combined Rank	Medium	Medium	Medium	-	-	Low	Medium	-		
3	Net-kesokes	Contribution		Medium	Medium	High					Low	
		Irreversibility		Low	Low	Medium						
		Override										
		Source	-	Low	Low	Medium	-	-	-	-		-
Active Threat		Combined Rank	-	Low	Low	Low	-	-	-	-		
4	Commercial harvesting	Contribution				Very High	Low				Medium	
		Irreversibility				Medium	Medium					
		Override										
		Source	-	-	-	High	Low	-	-	-		
Active Threat		Combined Rank	-	-	-	Medium	Low	-	-	-		
5	Subsistence harvesting	Contribution				High	Very High		High		High	
		Irreversibility				Medium	Medium		High			
		Override										
		Source	-	-	-	Medium	High	-	High	-		
Active Threat		Combined Rank	-	-	-	Low	Medium	-	High	-		
6	Boat traffic	Contribution			Medium				Low		Medium	
		Irreversibility			Low				High			
		Override										
		Source	-	-	Low	-	-	-	Medium	-		
Active Threat		Combined Rank	-	-	Low	-	-	-	Medium	-		

Table 6. Stresses and Sources of Stress on Large Reef Food Fish

Ecological Integrity Summary for this Target		Landscap e Context	Condition	Size	Integrity Rank
6	Large Reef Food Fish	Good	Fair	Fair	Fair

	Stresses	Severity	Scope	Stress
1	Fish population decline	High	High	High
2	Habitat degradation	Low	Medium	Low
3	Species disturbance	Medium	High	Medium
4	Change in population structure	High	High	High

Sources of Stress			Fish population decline	Habitat degradation	Species disturbance	Change in population structure	-	-	-	-	Threat to System Rank
Large Reef Food Fish			High	Low	Medium	High	-	-	-	-	
1	Subsistence harvesting	Contribution	High	High	Medium	High					Medium
		Irreversibility	Medium	High	Low	Medium					
		Override									
	Source	Medium	High	Low	Medium	-	-	-	-		
Active Threat		Combined Rank	Medium	Low	Low	Medium	-	-	-	-	
2	Commercial harvesting	Contribution	High	High	Medium	High					Medium
		Irreversibility	Medium	High	Low	Medium					
		Override									
	Source	Medium	High	Low	Medium	-	-	-	-		
Active Threat		Combined Rank	Medium	Low	Low	Medium	-	-	-	-	
3	Climate change	Contribution		Low							-
		Irreversibility		Low							
		Override									
	Source	-	Low	-	-	-	-	-	-		
Active Threat		Combined Rank	-	-	-	-	-	-	-	-	
4	Boat traffic	Contribution			Medium						Low
		Irreversibility			Low						
		Override									
	Source	-	-	Low	-	-	-	-	-		
Active Threat		Combined Rank	-	-	Low	-	-	-	-	-	
5	Recreational activities	Contribution		Medium	Low						Low
		Irreversibility		Low	Low						
		Override									
	Source	-	Low	Low	-	-	-	-	-		
Active Threat		Combined Rank	-	-	Low	-	-	-	-	-	

Table 8. Stresses and Sources of Stress on Beach and Cay Ecosystems

Ecological Integrity Summary for this Target		Landscape Context	Condition	Size	Integrity Rank
8	Beach and Cay Ecosystems	Good	Fair	Good	Good

	Stresses	Severity	Scope	Stress
1	Habitat degradation	Medium	High	Medium
2	Altered composition/structure	Medium	High	Medium

Sources of Stress			Habitat degradation	Altered composition/structure	-	-	-	-	-	-	Threat to System Rank
Beach and Cay Ecosystems			Medium	Medium	-	-	-	-	-	-	
1	Invasive/alien species	Contribution	High	High							Medium
		Irreversibility	Medium	High							
		Override									
	Source	Medium	High	-	-	-	-	-	-		
	Active Threat	Combined Rank	Low	Medium	-	-	-	-	-	-	
2	Climate change	Contribution	Low	Medium							Low
		Irreversibility	High	High							
		Override									
	Source	Medium	Medium	-	-	-	-	-	-		
	Active Threat	Combined Rank	Low	Low	-	-	-	-	-	-	
3	Increase erosion	Contribution	High	High							Medium
		Irreversibility	High	High							
		Override									
	Source	High	High	-	-	-	-	-	-		
	Active Threat	Combined Rank	Medium	Medium	-	-	-	-	-	-	
4	Recreational activities	Contribution	High	Low							Low
		Irreversibility	Medium	High							
		Override									
	Source	Medium	Medium	-	-	-	-	-	-		
	Active Threat	Combined Rank	Low	Low	-	-	-	-	-	-	
5	Sand mining	Contribution	Low	Low							Low
		Irreversibility	Medium	Medium							
		Override									
	Source	Low	Low	-	-	-	-	-	-		
	Active Threat	Combined Rank	Low	Low	-	-	-	-	-	-	
6	Boat traffic	Contribution	Low	Low							Low
		Irreversibility	Low	Medium							
		Override									
	Source	Low	Low	-	-	-	-	-	-		
	Active Threat	Combined Rank	Low	Low	-	-	-	-	-	-	

APPENDIX 3 Stakeholder Consultation Notes

- 1. Consultation dates and details**
- 2. Summary of consultation findings**
- 3. OERC, 2003. NBSAP Phase II report for Koror State.**
- 4. C3, 2003. Baseline Surveys and Threat Assessment of Dive Sites in Koror State.**
- 5. C3, 2003. Draft marine tour-guide manual for Koror State.**
- 6. Matthews, 2004. Subsistence Fishing Activities in the Rock Islands. PCS report no. 2004-01.**

1. STAKEHOLDER CONSULTATION DATES AND DETAILS

Date	Stakeholder group	Interviewees	Dept./company / group	Title	Main issues discussed	Interviewers
	HARVESTING/ CULTURE					
Feb 19 2003	Recreational fishing	Gov. Sakuma	Ngarrard State Govt.	Governor	Fishing/harvesting	I.O. & K.C.
Feb 19 2003	Recreational fishing	Bena Sakuma	Individual		Fishing/harvesting	I.O. & K.C.
Feb 18 2003	Harvesting/culture/co mmunity	Sam Moses	Individual	Retired cultural affairs	fishing/harvesting/culture	I.O. & K.C.
	Harvesting/culture/co mmunity	Roberta Louch	Individual	Retired womens affairs	fishing/harvesting/culture	I.O. & K.C.
	Harvesting/culture/co mmunity	Ochob	Individual	Retired Peace Corps director	fishing/harvesting/culture	I.O. & K.C.
Feb 18 2003	Recreational fishing	Silas Orruken	PMA	Director	fishing/harvesting	I.O. & K.C.
Feb 20 2003	Commercia/recreatio nal fishing	Noriwo Ubedei	Fisherman		fishing/harvesting	I.O. & K.C.
Feb 25 2003	Community issues/harvesting	Phillip Recklai Radio program with Bena Sakuma	Fisherman Head Start	Director	marine resources	I.O., K.C. & A.E.
Aug 19 2003	Subs/com/rec fishing	Masaharu Moros	Fisherman		harvesting/ sewage pollution	I.O.
Aug 29 2003	Community issues/harvesting	Echang community	Echang community meeting		harvesting regulations	I.O., A.E.
Sep 04 2003	Subs/com/rec fishing	Iyeka Ichiro	Fisherman		harvesting	I.O.
Mar 21 2004	Harvesting/ culture/community	Maiberel Women's Group	Maiberel Women's Group		overview of management plan	A.E., I.O., K.C.
	TOURISM					
Dec 03 2002	Tourism	Mary Ann Delemel	PVA	Executive Director	tourism/env.	I.O. & R.P
Dec 03 2003	Tourism	Lisa Abraham	PVA	Community services manager	tourism/env.	
Apr 28 2003	Tourism	Ron Leidich	Planet Blue	Owner	tourism/env.	K.C.

Date	Stakeholder group	Interviewees	Dept./company / group	Title	Main issues discussed	Interviewer s
Jun 10 2003	Tourism	Sam Scott	Sam's Tours/ BTA	Owner Sam's Tours/ BTA president	tourism/ env.	I.O. & K.C.
Jun 16 2003	Tourism	Tova and Navot	Fish n' Fins dive shop	Owners Fish n' Fins dive shop	tourism/ env.	I.O. & K.C.
Jun 16 2003	Tourism	Henni Rall	Neco Yamaha	General manager	tourism/harvesting/env.	I.O. & K.C.
Jun 17 2003	Tourism	Dermott	Sam's Tours	General manager	tourism/ env.	I.O. & K.C.
Jun 17 2003	Tourism (Tiawanese)	O.A.	PAIR	Manager		
		Kevin Liu and 6 other guides	PPC (power passion club)	Tour Guide	tourism	I.O. & K.C.
Jun 23 2003	Tourism (Japanese)	Asaya	IMPAC	Manager	tourism /env.	
Jul 01 2003	Tourism (Tiawanese)	Russell Weh	Palau International Tour	Tour Guide	tourism/env.	I.O.
Jun 25 2003	Tourism (live aboard)	Brian Stephenson and Ryan	Palau Agressor II	Captain's	tourism/env.	I.O. & K.C.
Jun 27 2003	Tourism	BTA exec committee	BTA		management plan, cert. Program	
Jul 05 2003	Tourism (Japanese)	Masao Kikuchi	Rock Island Tour Company	General manager	tourism /env.	I.O. & K.C.
		Morgan	Rock Island Tour Company	Palauan guide	tourism/env.	
Jul 02 2003	Tourism (Japanese)	Need name	Blue Marlin	Manager	tourism/env	email
Jul 08 2003	Tourism	Glenn and Michelle	Neco Dive Shop	Managers	tourism env.	
Informal disc.	Tourism	Matt	Sam's Tours	Dive Guide	jelly fish lake, tour-ops certification	K.C.
Informal disc.	Tourism	Keith Santiago	Dive Palau	Manger/guide	tour-ops cert, dive site congestion	K.C.

Date	Stakeholder group	Interviewees	Dept./company / group	Title	Main issues discussed	Interviewers
	GOVERNMENT					
Dec 03 2002	State Govt.	Lazarus Ulechong	KS cultural affairs	Director	Cultural issues	email
May 13 2003	National Government	Alma Ridep-Morris	MCPA Office of marine resources			I.O.
	National Government	Blake McNaughton	MCPA	U.S. peace corps		
Jul 03 2003	National Government	Kimie	MCPA			
Jul 03 2003	Tech committee/nat govt.	Tiger Gillham	EQBP	Executive Officer	Env. govt. issues	
Jul 03 2003	Tech committee	Andrew Smith	TNC	Pacific Marine Director	plan overview, priorities	
Jul 04 2003	Tech committee	Francis Matsutaro	PICRC	Director	PICRC reserarch priorities/ mg plan overview	
Jul 07 2003	National Government	Theo	Marine Resources	Director	env priorities	
Jul 10 2003	Tech committee	Caorl Emarius	PICRC/ node co-ordinator	Node co-ordinator	subsistence harvesting	
Jul 14 2003	Tech committee/nat govt.	Youlsau Bells	OERC	Director		
	SCIENTISTS					
Jul 30 2003	Independent researcher	Shannon Long	PICRC/ Dalhousie University, Canada	Masters student	Harvesting and dive surveys	K.C. & I.O.
Jul 31 2003	Tech committee/ research	Yimanang Golbou	PICRC	Chief Researcher	PICRC research activities,	K.C.
Jul 31 2003	Tech committee/ research	Lolita Penland	PICRC	researcher	Coral spawning	K.C.
Jul 31 2003	Tech committee/ research	David Idip Jr	PICRC	researcher	Seagrass	K.C.
Jul 31 2003	Tech committee/ research	Dr Pat Collins	CRRF	President	SPAGS- Ulong	K.C.
Jul 31 2003	Tech committee/ research	Lorie Collins	CRRF	Lab manager/ researcher	jelly fish lake,	K.C.
Jul 31 2003	Tech committee/ research	Dr Joel Miles	OERC/PCC (on sabbatical)	Terrestrial Co-ordinator	Invasive plants (terrestrial)	K.C. & I.O.

Appendix 4. Flora and Fauna of the Rock Islands-Southern Lagoon Management Area: Species Lists

Prepared by Michelle Moses, Koror State Department of Conservation and Law Enforcement 2004

REFERENCES USED FOR THE FLORA AND FAUNA LIST:

Barnes, R.D. 1974. *Invertebrate Zoology*. W. B. Sanders Company.

Holthus, P.F, Idechong, N., Thomas, P.E.J., 1989. *Ngerukewid Islands Wildlife Preserve management plan*. South Pacific Commision

Kardong, K.V. 1995. *Vertebrates: Comparative Anatomy, Function, Evolution*. Wm. C. Brown Publishers

Mathew & Oiterong, 1991. *The Role of Women in the Fisheries of Palau*. Oregon State University. 77 pp.

Raulerson, L., Rinehart, A., Falanruw, M., Singeo, Y., Siappy, S. and Victor, S. 1996. *A Botanical Reconnaissance of the Proposed Compact-Impact Road Alignment on Babeldaob Island, Republic of Palau*. University of Guam Contribution No. 32

REFERENCES USED FOR HARD CORALS OF PALAU LIST

Randal, R., 1995. Biogeography of Reef-Building Corals in the Mariana and Palau Islands in Relation to Back-Arc Rifting and the Formation of the Eastern Philippine Sea. *Natural History Research*, 22. Pp. 193-210

Terrestrial Flora of Koror State's Rock Islands-Southern Lagoon Area

Palauan name	Common name	Scientific name	Status (Endemic, Native Introduced, etc.)
		POLYPODIACEAE	
		<i>Antrphyum plantagineum</i>	
<i>Liker bedaoch</i>		<i>Asplenium laserpitifolium</i>	
<i>Bukel beluu; Occhema remark</i>	<i>Birds nest fern</i>	<i>Asplenium nidus</i>	
		<i>Asplenium polyodon</i>	
		<i>Belvisia spicata</i>	
		<i>Cyclopeltis kingii</i>	
		<i>Davallia solida</i>	
		<i>Humata banksii</i>	
<i>Teroter</i>		<i>Nephrolepis saligna</i>	
		<i>Polypodium punctatum</i>	
<i>Ebechab</i>		<i>Polypodium scolopendria</i>	
		<i>Pyrrosia laceolata</i>	
		<i>Tectaria crenata</i>	
		<i>Tectaria grandifolia</i>	
		<i>Thelypteris cf gretheri rupi-insularis</i>	
<i>Albeluu</i>		<i>Vittaria incurvata</i>	
		PSILOTACEAE	
		<i>Psilotum nudum</i>	
		SCHIZAEACEAE	
		<i>Actinostachys spirophylla</i>	
		CYCADACEAE	
<i>Kokeal; Remiang</i>		<i>Cycas circinalis</i>	
		CYPERACEAE	
<i>Kerngimesked</i>		<i>Fimbristylis cymosa</i>	
		DIOSCOREACEAE	
		<i>Dioscorea sp.</i>	
		FLAGELLARFACEAE	
<i>Bangerenguis</i>		<i>Flagellaria indica</i>	
		GRAMINEAE	
		<i>Lepturus repens</i>	
		HYDROCHARITACEAE	
		<i>Halophila minor</i>	
		LILIACEAE	
<i>Orredakl</i>		<i>Dracaena multiflora</i>	
		ORCHIDACEAE	

		<i>Liparis sp.</i>	
		<i>Taeniophyllum sp.</i>	
		<i>Taeniophyllum sp.</i>	
		<i>Taeniophyllum sp.</i>	
		PALMAE	
<i>Lius</i>	<i>Coconut tree</i>	<i>Cocos nucifera</i>	
<i>Ebouch</i>		<i>Gulubia palauensis</i>	
		PANDANACEAE	
<i>Beku, Ongor</i>		<i>Pandanus cf dubius</i>	
<i>Ongor</i>		<i>Pandanus cf tectorius</i>	
		<i>Halodule uninervis</i>	
		<i>Syngodium sp.</i>	
		POTAMOGETONACEAE	
		<i>Halodule uninervis</i>	
		<i>Syngodium sp.</i>	
		ACANTHACEAE	
		<i>Hemigraphis reptans</i>	
		APOCYNACEAE	
		<i>Alyxia palauensis</i>	
<i>Uaoch</i>		<i>Neisosperma oppositifolia</i>	
		<u>ARALIACEAE</u>	
		<i>Meryta senfftiana</i>	
<i>Kesiamel</i>		<i>Osmoxylon oliveri</i>	
<i>Bungaruau</i>		<i>Poliscias grandifolia</i>	
	<i>Five fingers</i>	<i>Schefflera odorata</i>	
		ASCLEPIADACEAE	
		<i>Dischidia hahliana</i>	
<i>Uralanguis</i>		<i>Sarcolobus sulphureus</i>	
		BORAGINACEAE	
		<i>Cordia subcordata</i>	
		<i>Tournefortia argentea</i>	
		BURSERACEAE	
<i>Mesecheues?</i>		<i>Canarium sp. (hirsutum?)</i>	
		CAPPARIDACEAE	
		<i>Capparis carolinensis</i>	
		<i>Capparis cordifolia</i>	
		<i>Capparis quinifolia</i>	
		CASUARINACEAE	
<i>Ngas</i>	<i>Ironwood</i>	<i>Casuarina equisetifolia</i>	
		CELASTRACEAE	
		<i>Maytenus palauaica</i>	

		COMBRETACEAE	
<i>Miich</i>	Pacific almond nut	<i>Terminalia catappa</i>	
<i>Esemiich</i>		<i>Terminalia samoensis</i>	
		EUPHORBIACEAE	
		<i>Drypetes nitida</i>	
		<i>Glochidion</i> sp.	
		<i>Glochidion</i> sp.	
<i>Bedel</i>		<i>Macaranga carolinensis</i> var. <i>carolinensis</i>	
		<i>Phyllanthus rupi-insularis</i>	
		GOODENIACEAE	
		<i>Scaevola sericea</i>	
		GUTTIFERAE	
<i>Btaches</i>		<i>Calophyllum inophyllum</i>	
		<i>Garcinia rumiyo</i> var. <i>calcicola</i>	
		HERNANDIACEAE	
<i>Dokou</i>		<i>Hernandia sonora</i>	
		HIPPOCRATACEAE	
<i>Kerangel</i>		<i>Loesneriella macrantha</i> var. <i>palauaica</i>	
		LECYTHIDACEAE	
		<i>Barringtonia asiatica</i>	
		LOGANIACEAE	
		<i>Geniostoma sessile</i>	
<i>Kalm; Aralm</i>		<i>Neubergia celebica</i>	
		<i>Pemphis acidula</i>	
		LEGUMINOCEAE	
<i>Dort</i>	Ifil	<i>Instia bijuga</i>	
		FABACEAE	
		<i>Desmodium umbellatum</i>	
<i>Kisakes</i>		<i>Pongamia pinnata</i>	
		MIMOSACEAE	
<i>Ukall</i>		<i>Serianthes kanehirae</i>	
		MALVACEAE	
<i>Chermal</i>		<i>Hubiscus tiliaceus</i>	
		MELIACEAE	
		<i>Aglaia palauensis</i>	
<i>Meduulokebong</i>		<i>Xylocarpus granatum</i>	

		MORACEAE	
<i>Meduu</i>		Artocarpus atilis	
		<i>Artocarpus mariannensis</i>	
		<i>Ficus microcarpa</i> var. <i>microcarpa</i>	
		<i>Ficus prolixa</i> var. <i>carolinensis</i>	
		<i>Ficus sagittata</i>	
		<i>Ficus senfftiana</i>	
<i>Oseked</i>		<i>Ficus tinctoria</i> var. <i>neo-</i> <i>ebudorum</i>	
		MYRISTICACEAE	
<i>Chemeklachel</i>		<i>Horsfeldia amklaal</i>	
<i>Chersachel</i>		<i>Horsfeldia novo-guieensis</i>	
<i>Chersachel</i>		<i>Horsfeldia palauensis</i>	
		<i>Myristica insularis</i>	
		MYRSINACEAE	
		<i>Discocalyx mezii</i> ?	
		<i>Discocalyx palauensis</i>	
		<i>Maesa palauensis</i>	
		MYRTACEAE	
<i>Kertaku</i>		<i>Decaspermum fruticosum</i>	
		<i>Decaspermum raymundii</i>	
		<i>Eugenia malaccensis</i>	
		<i>Eugenia cuminii</i>	
		<i>Eugenia palauensis</i>	
<i>Kesiil</i>		<i>Eugenia reinwardtiana</i>	
<i>Rebotel</i>		<i>Eugenia suzukii</i>	
<i>Kidel?</i>		<i>Eugenia javanica</i>	
		NEPENTHACEAE	
<i>Meliik</i>		<i>Nepenthes mirabilis</i>	
		NYCTAGINACEAE	
		<i>Pisonia grandis</i>	
		PIPERACEAE	
		<i>Peperomia kraemeri</i>	
<i>Rtertiil</i>		<i>Peperomia palauensis</i> var. <i>palauensis</i>	
		RHIZOPHORACEAE	
		<i>Rhizophora mucronata</i> var. <i>styolosa</i>	
		RUBIACEAE	
		<i>Aidia racemosa</i>	
<i>Ralm</i>		<i>Badusa palauensis</i>	

<i>Belau</i>		<i>Guettarda speciosa</i>	
		<i>Hedyotis</i> sp.	
		<i>Hedyotis stingulosa</i>	
<i>Ngel</i>		<i>Morinda citrifolia</i> ?	
<i>Tielar bekai; Odoid, Meldii</i>		<i>Ophiorrhiza palauensis</i>	
		<i>Psychotria</i> sp.	
		<i>Psychotria</i> sp.	
		SAPINDACEAE	
<i>Ebeludes?</i>		<i>Allophylus ternatus</i>	
		<i>Allophylus timoriensis</i>	
		STERCULIACEAE	
		<i>Sterculia palauensis</i>	
		SYMPLOCACEAE	
<i>Ebtui</i>		<i>Symplocos racemosa</i> var. <i>palauensis</i>	
		THYMELEACEAE	
<i>Tebudel; Rau</i>		<i>Wikstroemia elliptica</i>	
		TILIACEAE	
<i>Elsau</i>		<i>Trichospermum ledermannii</i>	
		URTICACEAE	
		<i>Elatostema calcareum</i>	
		<i>Pipturus argenteus</i>	
		VERBENACEAE	
<i>Dub; Rtachel</i>		<i>Callicarpa candicans</i> var. <i>intergrifolia</i>	
<i>Eruei; Keruia</i>		<i>Callicarpa elegans</i>	
		<i>Gmelina elliptica</i>	
		<i>Premna obtusifolia</i> (<i>serratifolia</i> ?)	

Fauna of Koror State's
Rock Islands-Southern Lagoon Area

Palauan Name	Common Name	Scientific Name
		Class Amphibia (2 spp.)
		<i>Bufonidae</i>
Dechedch	Toad	Bufo marinus
		<i>Ranidae</i>
Dechedch	Frog	Platymantis pelewensis
		Class Aves(30sp.)
Ochaieu	Adubon's Shearwater	Puffinus iherminieri
Bedoach	Black Noddy	Phaethon lepturus
Kerkirs	Black-naped Tern	Sterna sumatrana
	Bridled Tern	Sterna anathetus
Mechadelbedaob	Brown Noddy	Anous stolidus
	Cicadabird	Coracina tenurostris
Tengadidik	Collared Kingfisher	Tengadidik
Sechosech	Common Fairy-Tern	Sechosech
Bengobaingukl	Common Sandpiper	Bengobaingukl
	Dusky White-eye	Zosterops finschii
Iakkotsiang	Greater Sulphur-Crested Cockatoo	Cacatua galerita
Chesisekiaid	Island Swiftlet	Aerodramus vanikorensis
Derariik	Lesser Golden-Plover	Pluvialis dominica
Chermelachull	Mangrove Flycatcher	Myagra erythroptus
Chesisbangiau	Micronesian Honeyeater	Myzomela rubrata
Cherosech	Micronesian Kingfisher	Halcyon cinnamomina
Bekai	Micronesian Megapode	Megapodius laperouse
Belochel	Micronesian Pigeon	Ducula oceanica
Kiuid	Micronesian Starling	Aplonis opaca
Tutau	Morningbird	Colluricincla tenebrosa
Laib	Nicobar Pigeon	Caloenas nicobarica
Chesucherubuokel	Osprey	Pandion haliaetus
Sechou	Pacific Reef-Heron	Egretta sacra
Melimdelebtob	Palau Fantail	Rhipidura lepida
Biib	Palau Fruit Dove	Ptilinopus pelewensis
Omekrengukl	Palau Ground-Dove	Gallinolumba canifrons
Chesuch	Palau Owl	Pyrrhoglaux podargina
Sechou or Melebaob	Rufus Night-Heron	Nycticorax caledonicus
	Siberian Tattler	Heteroscelus brevipes
	Wandering Tattler	Heteroscelus incanus
Dudek	White-tailed tropicbird	Phaethon lepturus
		Class Mammalia

Olik	Micronesian Fruit Bat	Pteropus mariannus pelewensis
	Palau Fruit Bat	Pteropus pilosis
Chesisualik	Pacific Sheath-tailed Bat	Emballonura semicaudata
	Musk Shrew	Suncus marinus
Beab	House Mouse	Mus musculus
	Polynesian Rat	Rattus exulans
	Roof Rat	Rattus rattus
Mesekiu	Dugong	Dugong dugon
		Class Reptilia(37 spp.)
Berebur, Sechesech	Gekkos	Gekkonidae
	Web-toed gecko	Gehyra brevipalmata
	Stump-toed gecko	Gehyra mutilata
	Oceanic Big tree gecko	Gehyra oceanica
	Gecko	Gekko sp.
	Common house gecko	Hemidactylus frenatus
	Indo-pacific tree gecko	Hemiphylladactylus cf. H. typus
	Scaly-toed gecko	Lepidodactylus lugubris
	Mourning gecko	Lepidodactylus moestus
	Micronesian Scaly-toed gecko	Lepidodactylus paurolepis
	Palau Scaly-toed gecko	Nactus sp.
	Yellowbellied sea snake	Pelmais platurus
		Polychrotidae
		Anolis carolinensis
	Skinks	Scincidae
	Collard lizard	Cryptoblepharus sp.
	Brown four-fingered skink	Carlia cf. C. fusca
	Littoral skink	Emoia atrocostata
	Marianas blue-tailed skink	Emoia caeruleocauda
	Blue-tailed copper skink	Emoia impar
	Kopstein's skink	Emoia jakati
	Litter skink	Eugongylus sp.
Chemaidechedui	Green Tree Skink	Lamprolepis smaragdina
	Pandanus skink	Lipinia leptosoma
	Moth skink	Lipinia cf. L. noctua
	Many-striped skink	Mabuya sp.
	Common Skink	Sphenomorphus sp. Nov.
	Palauan Skink	Sphenomorphus scutatus
		Veranidae
	Gray Monitor	Varanus cf. v. indicus(Ngeriungs Is., Oreor)
	Snakes	Boidae
Bersoech	Pacific Island Boa	Candoia CF. C. carinata
		Colubridae
	Dog-faced water snake	Cerberus rynchops
Nguis	Palau Tree Snake	Dendrelaphis lineolatus
		Laticaudidae
Mengerger	Banded Sea Snake	Laticauda colubrina
		Typhlopidae
	Palau Blind snake	Ramphotyphlops acuticaudus
	Brahminy blind snake	Ramphotyphlops braminus
	Turtles	Chelidae
		Cheloniidae

Melob	Green Sea Turtle	Chelonia mydas
Ngas	Hawksbill Sea Turtle	Eretmochelys imbricata
	Leatherback turtle	Dermochelys coriacea
	Olive ridley	Lepidochelys olivacea
	Crocodiles	Crocodylidae
	Saltwater crocodile	Crocodylus porosus

PALAUAN	COMMON	SCIENTIFIC
	Surgeonfishes; Moorish idol; Rabbitfishes	<i>Acanthuroidei</i>
	Surgeonfishes; Unicornfishes	<i>Acanthuridae</i>
	Achilles tang	<i>Acanthus Achilles</i>
	Bariene surgeonfish	<i>Acanthus bariene</i>
Mesekuulbad		<i>Acanthus gahhm</i>
Isaseb	Whitespotted surgeonfish	<i>Acanthus gutatus</i>
	Palelipped surgeonfish	<i>Acanthus leucocheilus</i>
Belai	Buebanded surgeonfish	<i>Acanthus lineatus</i>
	White-freckled surgeonfish	<i>Acanthus maculiceps</i>
Chesengl	Elongate surgeonfish	<i>Acanthus mata</i>
Urur	Whiteneck surgeonfish	<i>Acanthus nigricans</i>
Masch	Brown surgeonfish	<i>Acanthus nigrofuscus</i>
Masch	Bluelined surgeonfish	<i>Acanthus nigroris</i>
Kelelaumai or Merebas	Orangeband surgeonfish	<i>Acanthus olivaceus</i>
Uais	Chocolate surgeonfish	<i>Acanthus pyroferus</i>
	Thompson's surgeonfish	<i>Acanthus thomsoni</i>
Chelas	Convict tang surgeonfish	<i>Acanthus triostegus triostegus</i>
Mesekuuk	Yellowfin surgeonfish	<i>Acanthus xanthopterus</i>
Masch	Twospot bristletooth	<i>Ctenochaetus binotatus</i>
	Chevron tang (juv.); Black surgeonfish (adult)	<i>Ctenochaetus hawaiiensis</i>
Masch	Striped bristletooth	<i>Ctenochaetus striatus</i>
	Brown tang	<i>Zebrasoma scopes</i>
	Sailfin tang	<i>Zebrasoa veliferum</i>
Mengai	Whitemargin surgeonfish	<i>Naso annulatus</i>
Chongchutl	Humpback unicornfish	<i>Naso brachycentron</i>
Sechou or Demrechl	Spotted unicornfish	<i>Naso brevirostris</i>
Demelengis or Borch	Blacktongue unicornfish; Sleek unicornfish	<i>Naso hexacanthus</i>
Cherangel	Orangespine unicornfish	<i>Naso lituratus</i>
	Lopez' unicornfish	<i>Naso lopezi</i>
Chongchutel	Humpnose unicornfish	<i>Naso tuberosus</i>
Chum	Bluespine unicornfish	<i>Naso unicornis</i>
Daraboksos, Melangesakl	Bignose unicornfish	<i>Naso vlamingii</i>
Mases	Palette surgeonfish	<i>Paracanthurus hepatus</i>
Masch	Two-tone tang	<i>Zebrasoma scopes</i>
Bisch	Sailfin tang	<i>Zebrasoma veliferum</i>
	Moorish Idol	<i>Zanclidae</i>
	Moorish Idol	<i>Zanclus cornutus</i>
	Rabbitfishes	<i>Siganidae</i>
Beduut	Forktail rabbitfish	<i>Siganus argenteus</i>
Meyas	Seagrass rabbitfish	<i>Siganus canaliculatus</i>
Reked	Coral rabbitfish	<i>Siganus corallinus</i>
Reked	Pencil-streaked rabbitfish	<i>Siganus doliatus</i>
	Fuscescens rabbitfish	<i>Siganus fuscescens</i>
	Golden rabbitfish	<i>Siganus guttatus</i>
Kelsebuul	Golden-lined spinefoot	<i>Siganus lineatus</i>
	White-spotted rabbitfish	<i>Siganus oramin</i>
Reked	Masked rabbitfish	<i>Siganus puellus</i>
Bebail	Gold-spotted rabbitfish	<i>Siganus punctatus</i>

	Peppered rabbitfish	<i>Siganus punctatissimus</i>
Chepsall	Scribbled rabbitfish	<i>Siganus spinus</i>
Reked	Foxface rabbitfish	<i>Siganus vulpinus</i>
Klsebuulimerang		<i>Siganus sp.</i>
Bersoech ra daob	Eels	Anguilliformes
	Moray Eels	Muraenidae
	Allardice's moray	<i>Anarchias allardicei</i>
	Canton Island moray	<i>Anarchias cantonensis</i>
	Long-jawed moray	<i>Channomuraena vittata</i>
	Whiteface moray	<i>Echidna leucotaenia</i>
	Snowflake moray	<i>Echidna nebulosa</i>
	Barred moray	<i>Echidna polyzona</i>
	Unicolor moray	<i>Echidna unicolor</i>
	Bayer's moray	<i>Echelycore bayeri</i>
	Viper moray	<i>Enchelynassa canina</i>
	Zebra moray	<i>Gynomuraena zebra</i>
	Buro moray	<i>Gymnothorax buroensis</i>
	Enigmatic moray	<i>Gymnothorax enigmaticus</i>
	Fimbriated moray	<i>Gymnothorax fimbriatus</i>
	Yellow-margined moray	<i>Gymnothorax flavimarginatus</i>
	Brown spotted moray	<i>Gymnothorax fuscomaculatus</i>
	Graceful-tailed moray	<i>Gymnothorax gracilicaudus</i>
Cholechulach	Giant moray	<i>Gymnothorax javanicus</i>
	Blotch-necked moray	<i>Gymnothorax margaritophorus</i>
	Marshall Islands moray	<i>Gymnothorax marshallensis</i>
	Dirty yellow moray	<i>Gymnothorax melatremus</i>
Kesebekuu	Whitemouth moray	<i>Gymnothorax meleagris</i>
	One-spot moray	<i>Gymnothorax monostigmus</i>
	Yellowmouth moray	<i>Gymnothorax nudivomer</i>
	Pinda moray	<i>Gymnothorax pindae</i>
	Richardson's moray	<i>Gymnothorax richardsoni</i>
	Yellow-headed moray	<i>Gymnothorax rueppelliae</i>
Sekelekoll	Undulated moray	<i>Gymnothorax undulates</i>
	Zonipectis moray	<i>Gymnothorax zonipectis</i>
	Peppered moray	<i>Siderea picta</i>
	White-eyed moray	<i>Siderea prosopoeion</i>
	Giant estuarine moray	<i>Strophidon sathete</i>
Luleu	Unicolor snake moray	<i>Uropterygius concolor</i>
	Brown spotted snake moray	<i>Uropterygius fuscoguttatus</i>
	Gosline's snake moray	<i>Uropterygius goslinei</i>
	Moon moray	<i>Uropterygius kamar</i>
	Large-headed snake moray	<i>Uropterygius macrocephalus</i>
	Marbled snake moray	<i>Uropterygius marmoratus</i>
	Large spotted snake moray	<i>Uropterygius polypilus</i>
	Many-toothed snake moray	<i>Uropterygius supraforatus</i>
	Freckle face reef eel	<i>Uropterygius xanthopterus</i>
	False morays	Chlopsidae
	Black-nostril false moray	<i>Kaupichthys atronasus</i>
	Shortfin false moray	<i>Kaupichthys brachychirus</i>
	Common false moray	<i>Kaupichthys hyoprroides</i>
	Conger Eels & Garden Eels	Congridae
	Moustache conger	<i>Conger cinereus cinereus</i>
	Spotted garden eel	<i>Heterocogner hassi</i>

	Spaghettie eels	<i>Moringuidae</i>
	Rusty spaghetti eel	<i>Moringua ferruginea</i>
	Java spaghetti eel	<i>Moringua javanica</i>
	Spaghetti eel	<i>Moringua microchir</i>
Mar	Snake Eels	<i>Ophichthidae</i>
Mar	Saddled snake eel	<i>Leiuranus semicinctus</i>
		<i>Muraenichthys gymnotus</i>
		<i>Muraenichthys laticaudata</i>
		<i>Muraenichthys macropterus</i>
		<i>Myorphis uropterus</i>
	Grooved-jaw warm eel	<i>Schismorhynchus labialis</i>
	Johnston snake eel	<i>Schultzidia johnstonensis</i>
		<i>Schultzidia retropinnis</i>
	Dark banded snake eel	<i>Callechelys catostomus</i>
	Convict snake eel	<i>Elapsopsis versicolor</i>
	False saddled snake eel	<i>Evipes percinctus</i>
	Vulture sand eel	<i>Icthyapus vultures</i>
	Saddled snake eel	<i>Leiuranus semicinctus</i>
	Banded snake eel	<i>Myrichthys colubrinus</i>
	Spotted snake eel	<i>Myrichthys maculosus</i>
	Short-maned sand eel	<i>Phaenomonas cooperae</i>
	Silversides	<i>Atheriniformes</i>
Teber	Silversides	<i>Atherinidae</i>
	Tropical silverside	<i>Atherinomorus duodecimalis</i>
Chedings, Teber	Hardyhead silverside	<i>Atherinomorus lacunosus</i>
	Ovalaua silverside	<i>Hypoatherina ovalaua</i>
	Panatella silverside	<i>Stenatherian panatela</i>
	Frogfishes	<i>Batrachoidiformes</i>
	Frogfishes	<i>Antennariidae</i>
	Freckled frogfish	<i>Antennarius coccineus</i>
	Bandtail frogfish	<i>Antennarius dorehensis</i>
	Spiny-fufted frogfish	<i>Antennarius rosaceus</i>
	Soldierfishes; Squirrelfishes	<i>Beryciformes</i>
	Soldierfishes & Squirrelfishes	<i>Holocentridae</i>
	Cardinal soldierfish	<i>Plectypops lima</i>
	Bronze soldierfish	<i>Myripristis adusta</i>
	Brick soldierfish	<i>Myripristis amaena</i>
	Bigscale soldierfish	<i>Myripristis berndti</i>
	Doubletooth soldierfish	<i>Myripristis hexagona</i>
	Pearly soldierfish; Shoulderbar soldierfish	<i>Myripristis kuntee</i> (<i>M. multiradiantus</i>)
	Red soldierfish	<i>Myripristis murdjan</i>
	Violet soldierfish, Orangefin soldierfish	<i>Myripristis violacea</i>
	White-tipped soldierfish	<i>Myripristis vittata</i>
	White-spot soldierfish	<i>Myripristis woodsi</i>
Kedaol		<i>Adioryx spp.</i>
Techelabilis or Chomouchedekl		<i>Adioryx diadema</i>
Desachel	Sabre squirrelfish	<i>Adioryx spinifer</i>
Techelabilis		<i>Adioryx tiere</i>
Kedaol		<i>Flammeo spp.</i>
	Clearfin squirrelfish	<i>Neoniphon argenteus</i>

	Blackfin squirrelfish	<i>Neoniphon opercularis</i>
	Bloodspot squirrelfish	<i>Neoniphon sammara</i>
	Tailspot squirrelfish	<i>Sargocentron caudimaculatum</i>
	Crown squirrelfish	<i>Sargocentron diadema</i>
	Blackspot squirrelfish	<i>Sargocentron melanospilos</i>
	Finelined squirrelfish	<i>Sargocentron microstoma</i>
	Dark-striped squirrelfish	<i>Sargocentron praslin</i>
	Speckled squirrelfish	<i>Sargocentron punctatissimum</i>
	Long-jawed squirrelfish	<i>Sargocentron spiniferum</i>
	Blue-lined squirrelfish	<i>Sargocentron tiere</i>
	Pink squirrelfish	<i>Sargocentron tieroides</i>
	Violet squirrelfish	<i>Sargocentron violaceum</i>
	Dolphins, Whales	Cetacea
Demul	Dolphins	<i>Coryphaenidae</i>
Chersuuch	Common Dolphin Fish	<i>Coryphaena hippurus</i>
	Anchovies; sprats; herrings; sardines	Clupeiformes
	Anchovies	<i>Engraulididae</i>
Merau		
	Little priest	<i>Thryssa baelama</i>
	Oceanic anchovy	<i>Encrasicholina punctifer</i>
	Blue anchovy	<i>Encrasicholina heterolobus</i>
	Gold anchovy	<i>Encrasicholina devisi</i>
	Gold estuarine anchovy	<i>Stolephorus insularis</i>
	Indian anchovy	<i>Stolephorus indicus</i>
	Sprats, Herrings, & Sardines	Clupeidae
	Hasselt's sprat	<i>Dussumiera elopsoides</i>
	Sharp-nosed sprat	<i>Dussumiera sp.</i>
Kuaol, Merau	Blue sprat	<i>Spratelloides delicatulus</i>
	Silver sprat	<i>Spratelloides gracilis</i>
	Spotted pilchard	<i>Amblygaster sirm</i>
Mekebud	Gold spot herring	<i>Herklotsichthyes quadrimaculatus</i>
Teber	Hardyhead	<i>Allanetta woodwardi</i>
Desomel	Graceful lizardfish	<i>Saurida gracilis</i>
	Nebulous lizardfish	<i>Saurida nebulosa</i>
	Twospot lizardfish	<i>Synodus binotatus</i>
	Variegated lizardfish	<i>Synodus variegates</i>
	Blackblotch lizardfish	<i>Synodus jaculum</i>
	Sand lizardfish	<i>Synodus dermatogenys</i>
	Needlefishes; Halfbeaks	Cyprinodontiformes
Sekos	Needlefishes	<i>Belonidae</i>
	Keeled needlefish	<i>Platybelone argalus platyura</i>
Teber		<i>Pranesus pinguis</i>
	Crocodile needlefish; Houndfish	<i>Tylosurus crocodiles crocodilis</i>
Sekos	Keel-jawed needlefish	<i>Tylosurus acus melanotus</i>
	Reef needlefish	<i>Strongylura incisa</i>
	Halfbeaks	Hemirhamphidae
	Spotted halfbeak	<i>Hemirhamphus far</i>
	Insular halfbeak	<i>Hyporhamphus affinis</i>
	Dussumier's halfbeak	<i>Hyporhamphus dussumieri</i>
	Estuarine halfbeak	<i>Zenarchopterus dispar</i>
	Snake Mackerels	Gempylidae
Telouchedui	Roudi escolar	<i>Promethichthys prom</i>

	Tarpons & Bonefishes	Elopiformes
	Tarpons	<i>Megalopidae</i>
Chaoldiong	Indo-Pacific tarpon	<i>Megalops cyprinoides</i>
	Bonefishes	Albulidae
	Indo-Pacific Bonefish	<i>Albula glossodonta</i>
Suld	Bonefish	<i>Albula vulpes</i>
	Clingfishes	Gobiesociformes
		<i>Gobiesocidae</i>
	Crinoid clingfish	<i>Lepadichthys caritus</i>
	Minor clingfish	<i>Lepadichthys minor</i>
	Milkfishes	Gonorhynchiformes
Aol	Milkfish	<i>Chanidae</i>
Aol	Milkfish	<i>Chanos chanos</i>
Chedeng	Sharks	Lamniformes
	Whale Shark	<i>Rhincodon typus</i>
	Nurse Shark	<i>Nebrius concolor</i>
Biall	Zebra shark	<i>Stegostoma varium</i>
Metmut		<i>Ginglymostoma ferrugineum</i>
	Leopard Shark	<i>Hemigaleidae</i>
Ulupsuchel	Reef whitetip shark	<i>Triaenodon obesus</i>
	Requiem sharks	Carcharhinidae
Besachel	Silvertip shark	<i>Carcharhinus albimarginatus</i>
Mederart, Teongt	Grey reef shark	<i>Carcharhinus amblyrhynchos</i>
	Silky shark	<i>Carcharhinus falciformis</i>
	Galapagos shark	<i>Carcharhinus galapagensis</i>
	Oceanic whitetip shark	<i>Carcharhinus longimanus</i>
Metukeoll	Reef blacktip shark	<i>Carcharhinus melanopterus</i>
Mochelas	Tiger shark	<i>Galeocerdo cuvier</i>
Metal	Lemon shark	<i>Negaprion acutidens</i>
Ulachelchedeng	Hammerhead Sharks	Sphyrnidae
Ulach	Scalloped hammerhead shark	<i>Sphyrna lewini</i>
	Great hammerhead shark	<i>Sphyrna mokorran</i>
	Thresher Sharks	Alopiidae
	Smalltooth thresher shark	<i>Alopias pelagicus</i>
Rull	Rays	Myliobatidiformes
	Sting rays	Dasyatidae
Dudek		<i>?Dasyatid bennetti</i>
Ilachetoil?	Blue spotted stingray	<i>Dasyatis kuhlii</i>
Kim	Leopard ray	<i>Himantura uarnak (Dasyatus gerrardi)</i>
Kultalchelbaeb	Black-spotted stingray, Giant reef ray	<i>?Taeniura melanospilos</i>
Ngilch	Feathertail stingray (palau)	<i>Pastinachus sephen</i>
Tubolkmerand	Thornback sting ray	
Ruetuu		
	Eagle Rays	Myliobatidae
Choचाio	Spotted eagle ray	<i>Aetobatis narinari</i>
	Manta Rays	
	Manta ray	<i>Manta alfredi</i>
	Sicklefin devil ray	<i>Mobula sp.</i>
	Cusk Eels	Ophidiformes
	Reef cusk eel	<i>Brotula multibarbata</i>
	Townsend's cusk eel	<i>Brotula townsendi</i>
	Livebearing Brotulas	Bythitidae
	Free-tailed reef brotula	<i>Brosomphyciops pautzkei</i>

	Yellow pygmy brotula	<i>Dinematchthys iluocoeteoides</i>
Cheremelamolech or Derirk	Pearlfishes	<i>Carapodidae</i>
Cheremelamolech or Derirk	Silver pearlfish	<i>Carapus homei</i>
	Pinchusion star pearlfish	<i>Carapus mourlani</i>
	Pinhead pearlfish	<i>Carapus parvipinnis</i>
	Graceful pearlfish	<i>Encheliophis gracilis</i>
	Worm pearlfish	<i>Encheliophis vermicularis</i>
	Bivalve pearlfish	<i>Onuxodon margaritifera</i>
	Pearlfishes	<i>Carapidae</i>
	Dragonfishes	<i>Pegasiformes</i>
	Dragonfishes	<i>Pegasidae</i>
	Short dragonfish	<i>Eurypegasus draconis</i>
	Basslets; Groupers	<i>Perciformes</i>
	Fairy Basslets & Groupers	<i>Serranidae</i>
Chubei	Redmouth grouper	<i>Aethaloperca rogaa</i>
Choloteachl	Whitelined grouper	<i>Anyperodon leucogrammicus</i>
Mengardelucheb, Mardelucheb, Mengardeluu	Peacock grouper; Blue-spotted grouper	<i>Cephalopholis argus</i>
	Brownbarred grouper	<i>Cephalopholis boenak</i>
Elewikl	Leopard grouper	<i>Cephalopholis leopardus</i>
Rukekai	Coral grouper	<i>Cephalopholis miniata</i>
	Harlequin grouper	<i>Cephalopholis polleni</i>
Bachungor	Cave grouper; Six-banded grouper	<i>Cephalopholis sexmaculata</i>
	Tomato grouper	<i>Cephalopholis sonnerati</i>
	Orange-red pigmy grouper	<i>Cephalopholis spiloparaea</i>
Ollos	Flagtail grouper	<i>Cephalopholis urodeta</i>
Melech	Pantherfish; Polkadot grouper(Humpback)	<i>Cromileptes altivelis</i>
	Snowy grouper	<i>Epinephelus caeruleopunctatus</i>
Chemirchorch, Mirchorch	Coral grouper	<i>Epinephelus corallicola</i>
	Brown-spotted grouper	<i>Epinephelus chlorostigma</i>
	Speckle Blue grouper	<i>Epinephelus dyctyophelus</i>
Temekai	Black-tipped grouper	<i>Epinephelus fasciatus</i>
Temekai		<i>Epinephelus flavocaeruleus</i>
Remochel (Meteungerel); Temekai	Blotchy grouper	<i>Epinephelus fuscoguttatus</i>
Keksau		<i>Epinephelus fuscus</i>
Meratch or Meratk	Hexagon grouper	<i>Epinephelus hexagonatus</i>
luch el temekai	Giant grouper	<i>Epinephelus lanceolatus</i>
	Snub nose grouper	<i>Epinephelus macrospilus</i>
	Highfin grouper	<i>Epinephelus maculatus</i>
	Malabar grouper	<i>Epinephelus malabricus</i>
	Blackspot honeycomb grouper	<i>Epinephelus melanostigma</i>
Chemirchorch or Mirchorch	Honeycomb grouper	<i>Epinephelus merra</i>
Ksau	Black Saddled grouper	<i>Epinephelus houlandi</i>
	Netfin grouper	<i>Epinephelus miliaris</i>
		<i>Epinephelus poecilonotus</i>
	Marbled grouper/Red tipped	<i>Epinephelus polyphkadion</i>
	Foursaddled grouper	<i>Epinephelus pilotoceps</i>
		<i>Epinephelus summana</i>
Bachungor	Greasy grouper	<i>Epinephelus tauvina</i>
		<i>Epinephelus tukula</i>
Bekeurasengerruk or	White-margined grouper	<i>Gracila albomarginata</i>

Mardelucheb		
Tiau	Squairetail grouper; Squairetail coral trout	<i>Plectropmus areolatus</i>
Tiau, Katuultiau, Mokas	Saddleback grouper; Giant coral trout	<i>Plectropumus laevis</i>
Mokas	Leopard coral trout	<i>Plectropumus leopardus</i>
Katuultiau		<i>Plectropumus melanoleucus</i>
Basolokiil?	Bue lined coral trout	<i>Plectropumus oligacanthus</i>
Mokas	Giant coral grouper	<i>Plectropumus truncates</i>
	Whitemargin tyretail grouper	<i>Variola louti</i>
Basongokiil or Basolokiil	Lyretail grouper; Lyretail coral trout	<i>Variola louti</i>
	Pinstriped basslet	<i>Liopropoma mitratum</i>
	Manyline perch	<i>Liopropoma multilineatum</i>
	Pinstriped basslet	<i>Liopropoma susumi</i>
	Redstriped basslet	<i>Liopropoma tonstrinum</i>
	Magenta slender basslet	<i>Luzonichthys waitei (L. addisi)</i>
	Whitley's slender basslet	<i>Luzonichthys whitleyi</i>
	Red-cheeked fairy basslet	<i>Pseudanthias huchtii</i>
	Scalefin or Lyretail fairy basslet	<i>Pseudanthias squammipinnis</i>
	Red-bar fairy basslet	<i>Pseudanthias cooperi</i>
	Square-spot fairy basslet	<i>Pseudanthias pleurotaenia</i>
	Randall's fairy basslet	<i>Pseudanthias randalli</i>
	Bartlett's fairy basslet	<i>Pseudanthias</i>
	Peach fairy basslet	<i>Pseudanthias dispar</i>
	Bicolor fairy basslet	<i>Pseudanthias bicolor</i>
	Lori's anthias	<i>Pseudanthias lori</i>
	Purple queen	<i>Pseudanthias pascalus</i>
	Smithvaniz'fairy basslet	<i>Pseudanthias smithvanizi</i>
	Yellowstriped fairy basslet	<i>Pseudanthias tuka</i>
	Hawkfish anthias	<i>Serranocirrhitis latus</i>
	Pygmy basslet	<i>Plectranthias nanus</i>
	Soapies	<i>Leiognathidae</i>
Deluai	Tooth pony	<i>Gazza minuta</i>
Keyam	Common ponyfish	<i>Leiognathus equulus</i>
	Soapfishes	<i>Grammistidae</i>
	Chabanaud's soapfish	<i>Belonoperca chabanaudi</i>
	Skunkfish; Yellowstriped soapfish	<i>Grammistes sexlineatus</i>
	Ocellate soapfish	<i>Grammistops ocellatus</i>
	Twolined soapfish	<i>Pseudogramma bilinearis</i>
		<i>Pseudogramma polyacantha</i>
	Comet	<i>Calloplelesops altivelis</i>
	Red-tiped longfin	<i>Plesiops corallicola</i>
	Surge dottyback	<i>Pseudochromis cyanotaenia (P. tapienosoma)</i>
	Dusky dottyback	<i>Pseudochromis fuscus (P. aurea)</i>
	Long-finned dottyback	<i>Pseudochromis polynemus</i>
	Magenta dottyback	<i>Pseudochromis porphyreus</i>
	Black-banded dottyback	<i>Pseudochromis tapienosoma</i>
	Rose Island basslet	<i>Pseudoplesiops rosae</i>
	Hawkfishes	<i>Cirrhitidae</i>
	Two-spotted hawkfish	<i>Amblycirrhitis bimacula</i>
	Falco hawkfish	<i>Cirrhitichthys falco</i>
	Pixy hawkfish	<i>Cirrhitichthys oxycephalus</i>
Odiduerabong	Stocky hawkfish	<i>Cirrhitis pinnulatus</i>

	Flame hawkfish	<i>Neocirrhites armatus</i>
	Longnose hawkfish	<i>Oxycirrhites typus</i>
Merirchesengl	Arc-eye hawkfish	<i>Paracirrhites arcatus</i>
	Freckled hawkfish; Blackside hawkfish	<i>Paracirrhites forsteri</i>
	Whitespot hawkfish	<i>Paracirrhites hemistictus</i>
Basolokiil	Black side hawkfish	<i>Paracirrhites forsteri</i>
	Cardinalfishes	Apogonidae
	Ocellated cardinalfish	<i>Apogonichthys ocellatus</i>
	Perdix cardinalfish	<i>Apogonichthys perdix</i>
	Spotcheek cardinalfish	<i>Fowleria punctulata</i>
	Marbled cardinalfish	<i>Fowleria marmorata</i>
	Luminous cardinalfish	<i>Rhabdamia cypselurus</i>
	Black cardinalfish	<i>Apogon melas</i>
	Bandfin cardinalfish	<i>Apogon taeniopterus</i>
	Eyeshadow cardinalfish	<i>Apogon exostigma</i>
	Bridled cardinalfish	<i>Apogon fraenatus</i>
	Iridescent cardinalfish	<i>Apogon kallopterus</i>
	Redspot cardinalfish	<i>Apogon dispar</i>
	Hartzfeld's cardinalfish	<i>Apogon hartzfeldii</i>
	Sangi cardinalfish	<i>Apogon sangiensis</i>
	Bigeye cardinalfish	<i>Apogon bandanensis</i>
	Gray cardinalfish	<i>Apogon fuscus</i>
	Guam cardinalfish	<i>Apogon guamensis</i>
	Broadstriped cardinalfish	<i>Apogon angustatus</i>
	Reef-flat cardinalfish	<i>Apogon taeniophorus</i>
	Black-striped cardinalfish	<i>Apogon nigrofasciatus</i>
	Seven-striped cardinalfish	<i>Apogon novemfasciatus</i>
	Ochre-striped cardinalfish	<i>Apogon compressus</i>
	Seale's cardinalfish	<i>Apogon sealei</i>
	Yellow cardinalfish	<i>Apogon cyanosoma</i>
	Fragile cardinalfish	<i>Apogon fragilis</i>
	Gilbert's cardinalfish	<i>Apogon gilberti</i>
	Bluestreak cardinalfish	<i>Apogon leptacanthus</i>
	Pearly cardinalfish	<i>Apogon perlitus</i>
	Twinspot cardinalfish	<i>Archamia biguttata</i>
	Oranglined cardinalfish	<i>Archamia fucata</i>
	Blackbelted cardinalfish	<i>Archamia zosterophora</i>
	Pajama cardinalfish	<i>Sphaeramia nematoptera</i>
	Orbiculate cardinalfish	<i>Sphaeramia orbicularis</i>
	Dog-toothed cardinalfish	<i>Cheilodipterus isostigma</i>
	Lined cardinalfish	<i>Cheilodipterus artus</i>
	Large-toothed cardinalfish	<i>Cheilodipterus macrodon</i>
	Five-lined cardinalfish	<i>Cheilodipterus quinquelineata</i>
	B-spot cardinalfish	<i>Gymnpogon urosilotus</i>
	White-jawed cardinalfish	<i>Pseudamia amblyuroptera</i>
	Hayashi's cardinalfish	<i>Pseudamia hayashii</i>
	Gelatinous cardinalfish	<i>Pseudamia gelatinosa</i>
	Paddlefin cardinalfish	<i>Pseudamia zonata</i>
	Graceful-tailed cardinalfish	<i>Pseudamiops gracilicauda</i>
Sebus; Sebusmerand	Cardinalfishes	Apogonidae
	Grunters	Theraponidae
	Crescent-banded grunter	<i>Therapon jarbua</i>

	Flagtails	Kuhliidae
	Dark-margined flagtail	<i>Kuhlia marginata</i>
	Barred flagtail	<i>Kuhlia mugil</i>
	Rock flagtail	<i>Kuhlia rupestris</i>
	Bigeyes	<i>Priacanthidae</i>
	Glasseye	<i>Heteropriacanthus cruentatus</i>
Dechil ebakl or Dechil a deil	Google-eye	<i>Priacanthus hamrur</i>
	Sand tilefishes	<i>Malacanthidae</i>
	Stocky sand tilefish	<i>Hiplolatilus fronticinctus</i>
	Purple-headed sand tilefish	<i>Hoplolatilus starcki</i>
	Quakerfish	<i>Malacanthus brevirostris</i>
	Striped blanquillo	<i>Malacanthus latovittatus</i>
	Tilefish	<i>Branchiostegidae</i>
	Striped blanquillo	<i>Malacanthus latovittatus</i>
Baiei		<i>Malacanthus hoedtii</i>
Rekereked	Sharksuckers & Remoras	<i>Echeneididae</i>
Rekereked	Sharksucker	<i>Echeneis naucrates</i>
Rekereked	Remora	<i>Remora remora</i>
	Jacks & Trevallys	<i>Carangidae</i>
	Yellowtail scad	<i>Atule mate</i>
Ulekreoul	African pompano	<i>Alectis ciliaris</i>
	Mackerel scad	<i>Decapterus macarellus</i>
	Yellowband scad	<i>Sealar boops</i>
Terekriik	Bigeye scad; Atulai	<i>Selar crumenophthalmus</i>
	Threadfin pompano	<i>Alectis ciliaris</i>
	Indian threadfish	<i>Alectis indicus</i>
Wii	Golden trevally	<i>Gnathanodon speciosus</i>
	Shadow kingfish	<i>Carangoides dinema</i>
	Bar jack	<i>Carangoides ferdau</i>
lab	Yellow-dotted trevally	<i>Carangoides fulvoguttatus</i>
Otewot	Yellow-spotted trevally	<i>Carangoides orthogrammus</i>
	Barcheek trevally	<i>Carangoides plagiotaenia</i>
Cherobk or Chederobk	Giant trevally	<i>Caranx ignobilis</i>
Chomuktutau	Black jack	<i>Caranx lugubris</i>
Oruidel	Bluefin trevally	<i>Caranx melampygus</i>
Klspeached		<i>Caranx mate</i>
Oruidel	Brassy trevally	<i>Caranx papuensis</i>
Esuuch	Bigeye trevally	<i>Caranx sexfasciatus</i>
Yas	Leatherback; Lae	<i>Scomberoides lysan</i>
Desui	Rainbow runner	<i>Elagatis bipinnulatus</i>
Terekrik	Bigeye scad	<i>Selar crumenophthalmus</i>
	Greater amberjack	<i>Seriola dumerili</i>
Mekeim	Almaco jack	<i>Seriola rivoliana</i>
	Small-spotted pompano	<i>Trachinotus bailloni</i>
Luichlbuil	Silver pompano	<i>Trachinotus blochii</i>
Terekrik		<i>Trachurus boops</i>
Recherached	Whitetongue jack	<i>Uraspis helvola</i>
	Ponyfishes; Slipmouths	<i>Leiognathidae</i>
	Common slipmouth	<i>Leiognathus equulus</i>
Chedochd	Mojarras	<i>Gerreidae</i>
Chedochd	Deep-bodied mojarra	<i>Gerres crythrourus</i>
	Common mojarra	<i>Gerres argyreus</i>
	Filamentous mojarra	<i>Gerres filamentosus</i>

Chesall (sm), Kotikw (lg)	Oblong mojarra	<i>Gerres oblongatus</i>
	Oyena mojarra	<i>Gerres oyena</i>
Omoket		<i>Gerres punctatus</i>
	Whitings	<i>Sillaginidae</i>
Melechies	Silver sillago	<i>Sillago sihama</i>
	Snappers	<i>Lutjanidae</i>
Krong	Blue smalltooth jobfish	<i>Aphareus furca</i>
Metngui	Rusty jobfish	<i>Aphareus rutilans</i>
Udel	Jobfish; Uku	<i>Aprion virescens</i>
Edui	Blue-lined sea bream	<i>Symphorichthys spilurus</i>
Ulekiued	Fusilier	<i>Caesio spp.</i>
Sebus		<i>Etelis marshi</i>
Kedesaulyengel	River snapper	<i>Lutjanus argentimaculatus</i>
Kesebii	Two-spot snapper	<i>Lutjanus biguttatus</i>
Kotongl (sm), Kedesau (lg)	Red snapper; Twinspot snapper	<i>Lutjanus bohar</i>
	Checkered snapper	<i>Lutjanus decussates</i>
	Blackspot snapper	<i>Lutjanus ehrenberi</i>
Reyall or Kesebii	Flametail snapper	<i>Lutjanus fulvus</i>
Keremlal	Humpback snapper	<i>Lutjanus gibbus</i>
	Bluelined snapper	<i>Lutjanus kasmira</i>
Sebus	Malabar snapper	<i>Lutjanus malabricus</i>
Derringel	Onespot snapper	<i>Lutjanus monostigmus</i>
	Scribbled snapper	<i>Lutjanus rivulatus</i>
	Half-barred snapper	<i>Lutjanus semicinctus</i>
Dodes	One-lined snapper	<i>Lutjanus vitta</i>
Sakuradei		<i>Lutjanus sp.</i>
Debull or Mengeselblad		<i>Lutjanus sp.</i>
	Black-and-white snapper	<i>Macolor macularis</i>
Ngkalatk	Black snapper	<i>Macolor niger</i>
Sebus		<i>Pristipomoides brighami</i>
Metengui	Crimson jobfish	<i>Pristopomodes filamentosus roseus</i>
	Lavender jobfish	<i>Pristopomes sieboldii</i>
Turang	Oblique-banded snapper	<i>Pristipomoides zonatus</i>
Ulekiued	Fusslier	<i>Pterocaesio spp.</i>
Akamuro	Fusiliers	<i>Caesionidae</i>
	Lunar fusilier	<i>Caesio lunaris</i>
	Yellowback fusilier	<i>Caesio teres</i>
	Yellowstreak fusilier	<i>Pterocaesio lativittata</i>
	Bluestreak fusilier	<i>Pterocaesio tile</i>
	Ruddy fusilier	<i>Pterocaesio pisang</i>
	Three-striped fusilier	<i>Pterocaesio trilineata</i>
	Grunts & Sweetlips	<i>Haemulidae</i>
Debelich	Slatey sweetlips	<i>Diagramma pictum</i>
	Two-stripe d sweetlips	<i>Plectorhinchus albiovittatus</i>
Merar	Clelebes sweetlips	<i>Plectorhinchus celebicus</i>

Bochol	Harlequin sweetlips	<i>Plectorhinchus chaetodonoides</i>
Korriu	Lined sweetlips	<i>Plectorhinchus gaterinoides</i>
	Gibbus sweetlips	<i>Plectorhinchus gibbosus</i>
Yaos	Goldman's sweetlips	<i>Plectorhinchus goldmanni</i>
Melimraim(sm), Bikl (lg)	Giant sweetlips	<i>Plectorhinchus obscurus</i>
Yaos	Oriental sweetlips	<i>Plectorhinchus orientalis</i>
	Spotted sweetlips	<i>Plectorhinchus picus</i>
Besechamel (sm), Mekedchelwel (lg)		<i>Pomadasyus hasta</i>
	Common javelin fish	<i>Pomadasyus kaakan</i>
	Twoline spinecheek	<i>Scolopsis bilineatus</i>
	Ciliate spinecheek	<i>Scolopsis ciliatus</i>
	Black-and-white spiecheek	<i>Scolopsis lineatus</i>
	Margarite's spinecheek	<i>Scolopsis Margaritifera</i>
	Spinecheek	<i>Scolopsis affinis</i>
	Three- lined spinecheek	<i>Scolopsis trilineatus</i>
	Emperors	<i>Lethrinidae</i>
Ulekiull or Bodes	Yellowspot emperor	<i>Gnathodentex aurolineatus</i>
Metengui		<i>Gymnocranius japonicus</i>
Rekruk	Ambon emperor	<i>Lethrinus amboinensis</i>
	Yellowbrow emperor	<i>Lethrinus atkinsoni</i>
Melangmud	Longnose emperor	<i>Lethrinus elongates</i>
	Orangefin emperor	<i>Lethrinus erythracanthus</i>
	Masked emperor	<i>Lethrinus erythropterus</i>
Chudch	Longspine emperor	<i>Lethrinus genivittatus</i> (<i>L. nematacanthus</i>)
Metengui?		<i>Lethrinus haematopterus</i>
Chudch		<i>Lethrinus nemata canthus obsoletus</i>
Itotech	Blackspot emperor/Thumbprint	<i>Lethrinus harak</i>
Menges		<i>Lethrinus kallopterus</i>
Mechur	Redspot emperor	<i>Lethrinus lentjan</i>
Krol		<i>Lethrinus mahsena</i>
Metengui	Yellow-brown emperor/pink ear	<i>Lethrinus mahsenoides</i>
Mlangmud	Smalltooth emperor	<i>Lethrinus Microdon</i>
Mechur		<i>Lethrinus Miniatus</i>
Chudech	Orange-striped emperor	<i>Lethrinus nemata canthus, L. obsoletus</i>
Itotech	Blackspot emperor/Thumbprint	<i>Lethrinus harak</i>
Menges		<i>Lethrinus kallopterus</i>
Mechur	Redspot emperor	<i>Lethrinus lentjan</i>
Krol		<i>Lethrinus mahsena</i>
Metengui	Yellow-brown emperor/pink ear	<i>Lethrinus mahsenoides</i>
Mechur		<i>Lethrinus Microdon</i>
Mlangmud	Smalltooth emperor	<i>Lethrinus Miniatus</i>
Mechur		<i>Lethrinus Miniatus</i>
Chudech	Orange-striped emperor	<i>Lethrinus nemata canthus, L. obsoletus</i>
	Yellowstripe emperor	<i>Lethrinus obsoletus</i>
	Longnose emperor	<i>Lethrinus olivaceus</i>
	Ornate emperor	<i>Lethrinus ornatus</i>
	Redgill emperor	<i>Lethrinus rubrioperculatus</i>
	Reef flat emperor	<i>Lethrinus semicinctus</i>
	Slender emperor	<i>Lethrinus variegates</i>

Mechur	Yellowlip emperor	<i>Lethrinus xanthurus</i>
Elewikl		<i>Lethrinus sp.</i>
Rekruk		<i>Lethrinus sp.</i>
Itotech	Thumbprint emperor	<i>Lethrinus sp.</i>
Besechamel	Bigeye emperor	<i>Monotaxis grandoculis</i>
	Pink okapaka/Crimson jobfish	<i>Pristopomoides filamentosus roseus</i>
Metengui	Lavender jobfish	<i>Pristopomoides sieboldii</i>
Kllibeitaochell	Lethrind	
Metnguultoachel	Lethrind	
Chesichucher	Lethrind	
	Goatfishes	<i>Mullidae</i>
Dech	Yellowstripe goatfish	<i>Mulloidides flavolineatus</i>
	Yellowfin goatfish	<i>Mulloidides vanicolensis</i>
Chemisech		<i>Mulloidichthys samoensis</i>
	Half-and-half goatfish	<i>Parupeneus barberinoides</i>
Bang	Dash-and-dot goatfish	<i>Parupeneus barberinus</i>
Chedebedobr	Two-barred goatfish	<i>Parupeneus bifasciatus</i>
Oiachd, Turanglbang	Yellowsaddle goatfish; Yellow	<i>Parupeneus cyclostomus</i>
	Redspot goatfish	<i>Parupeneus heptacanthus</i>
Idebsungl	Indian goatfish	<i>Parupeneus indicus</i>
	Multibarred goatfish	<i>Parupeneus multifasciatus</i>
	Sidespot goatfish	<i>Parupeneus pleurostigma</i>
	Banded-tailed goatfish	<i>Parupeneus taeniopterus</i>
Bang		<i>Parupeneus trifasciatus</i>
Uleangl	Blackstriped goatfish	<i>Upeneus tragula</i>
Uleangl	Yellow striped goatfish	<i>Upeneus vittatus</i>
	Sweepers	<i>Pempheridae</i>
	Pigmy sweeper	<i>Parapriacanthus ransonneti</i>
	Bronze sweeper	<i>Pempheris ovalensis</i>
	Rudderfishes; Sea Chubs	<i>Kyphosidae</i>
Keichul(sm); Kokmud(lg)	Highfin rudderfish; Snubnose chub	<i>Kyphosus cinerascens</i>
Keichul(sm); Kokmud(lg)	Lowfin rudderfish; Brassy chub	<i>Kyphosus vaigiensis</i>
	Monos	<i>Monodactylidae</i>
	Mono	<i>Monodactylus argenteus</i>
	Scats	<i>Scatophagidae</i>
	Scat	<i>Scatophagus argus</i>
	Batfishes; Spadefishes	<i>Ephippidae</i>
	Circular spadefish; Batfish	<i>Platax orbicularis</i>
Llameduu (sm); Bulls (lg)	Pinnate spadefish	<i>Platax pinnatus</i>
	Longfin spadefish	<i>Platax teira</i>
Chelbesoi (all except for C. unimaculatus)	Butterflyfishes	<i>Chaetodontidae</i>
Chelebsoi	Threadfin butterflyfish	<i>Chaetodon auriga</i>
	Eastern triangular butterflyfish	<i>Chaetodon barronessa</i>
	Bennet's butterflyfish	<i>Chaetodon benneti</i>
	Burgess's butterflyfish	<i>Chaetodon burgessi</i>
	Speckled butterflyfish	<i>Chaetodon citrinellus</i>
	Saddled butterflyfish	<i>Chaetodon ephippium</i>
	Klein's butterflyfish	<i>Chaetodon kleinii</i>
	Lined butterflyfish	<i>Chaetodon lineolatus</i>
	Racon butterflyfish	<i>Chaetodon lunula</i>

	Black-backed-butterflyfish	<i>Chaetodon melannotus</i>
	Merten's butterflyfish	<i>Chaetodon mertensii</i>
	Meyer's butterflyfish	<i>Chaetodon meyeri</i>
	Spot-tail butterflyfish	<i>Chaetodon ocellicaudus</i>
	Eight-banded butterflyfish	<i>Chaetodon octofasciatus</i>
	Ornate butterflyfish	<i>Chaetodon ornatissimus</i>
	Spot-nape butterflyfish	<i>Chaetodon oxycephalus</i>
	Spot-banded butterflyfish	<i>Chaetodon unimaculatus</i>
	Latticed butterflyfish	<i>Chaetodon rafflessi</i>
	Reticulated butterflyfish	<i>Chaetodon reticulatus</i>
	Dotted butterflyfish	<i>Chaetodon semeion</i>
	Oval butterflyfish	<i>Chaetodon speculum</i>
	Chevroned butterflyfish	<i>Chaetodon trifascialis</i>
	Redfin butterflyfish	<i>Chaetodon trifasciatus</i>
	Pacific double-saddle butterflyfish	<i>Chaetodon ulietensis</i>
	Teardrop butterflyfish	<i>Chaetodon unimaculatus</i>
	Vegabon butterflyfish	<i>Chaetodon vagabundus</i>
Chelebsoi	Orange-banded coralfish	<i>Coradion chrysozonus</i>
Chelebsoi	Long-nosed butterflyfish	<i>Forcipiger flavissimus</i>
	Big long-nosed butterflyfish	<i>Focipiger longirostris</i>
	Pyramid butterflyfish	<i>Hemitaurichthys polyepis</i>
Kaming	Long-fin bannerfish	<i>Heniochus acuminatus</i>
	Pennant bannerfish	<i>Heniochus chrysostomus</i>
	Masked bannerfish	<i>Heniochus monoceros</i>
	Singular bannerfish	<i>Heniochus singularis</i>
	Humphead bannerfish	<i>Heniochus varius</i>
	Angelfishes	<i>Pomacanthidae</i>
	Three-spot angelfish; Flagfin angelfish	<i>Apolemichthys trimaculatus</i>
	Bicolor angelfish	<i>Centropyge bicolor</i>
Ngemngumk	Two-spined angelfish; Dusky angelfish	<i>Centropyge bispinosus</i>
	Colin's angelfish	<i>Centropyge coloni</i>
	White-tail	<i>Centropyge flavicauda</i>
	Lemonpeel	<i>Centropyge flavissimus</i>
	Herald's	<i>Centropyge heraldi</i>
	Flame	<i>Centropyge loriculus</i>
	Multibarred	<i>Centropyge multifasciatus</i>
	Midnight	<i>Centropyge nox</i>
	Keyhole	<i>Centropyge tibicen</i>
Mud		<i>Centropyge spp.</i>
	Blackspot	<i>Genicanthus melanospilos</i>
Ngemngumk	Regal	<i>Pygoplites diacanthus</i>
	Vermiculated	<i>Chaetodontoplus mesoleucus</i>
Klbou	Emperor angelfish	<i>Pomacanthus imperator</i>
	Blue-gridled	<i>Pomacanthus navarchus</i>
	Yellow-faced angelfish; Blue-faced angelfish	<i>Pomacanthus xanthometopon</i>
	Emperor angelfish	<i>Pomacanthus imperator</i>
	Semicircle angelfish	<i>Pomacanthus semicirculatus</i>
	Damselishes	<i>Pomacentridae</i>
	Orange-fine anemonefish	<i>Amphiprion chrysopterus</i>
	Clark's anemonefish	<i>Amphiprion clarkii</i>
	Dusky anemonefish	<i>Amphiprion melanopus</i>

	Pink anemonefish	<i>Amphiprion perideraion</i>
Cheremelamerand	Yellow-speckled chromis	<i>Chromis alpha</i>
	Ambon chromis	<i>Chromis amboinensis</i>
	Yellow chromis	<i>Chromis analis</i>
	Black-axil chromis	<i>Chromis atripectoralis</i>
	Dark-fin chromis	<i>Chromis atripes</i>
	Blue-axil chromis	<i>Chromis caudalis</i>
	Deep reef chromis	<i>Chromis delta</i>
	Twin-spot chromis	<i>Chromis elerae</i>
	Scaly chromis	<i>Chromis lepidolepis</i>
	Lined chromis	<i>Chromis lineata</i>
	Bicolor chromis	<i>Chromis margaritifer</i>
	Ternate chromis	<i>Chromis ternatensis</i>
	Vanderbilt's chromis	<i>Chromis vanderbelti</i>
	Blue-green chromis	<i>Chromis viridis</i>
	Weber's chromis	<i>Chromis weberi</i>
	Yellow-axil chromis	<i>Chromis xanthochir</i>
	Black chromis	<i>Chromis xanthura</i>
Cheremelamerand	Humbug dascyllus	<i>Dascyllus aruanus</i>
	Black-tail dascyllus	<i>Dascyllus melanurus</i>
	Reticulated dascyllus	<i>Dascyllus reticulatus</i>
	Three-spot dascyllus	<i>Dascyllus trimaculatus</i>
	Fusilier damsel	<i>Lepidozygus tapienosoma</i>
	Big-lip damsel; Minstrel fish	<i>Cheiloprion labiatus</i>
Kllibei	Bengal sergeant	<i>Abudefduf bengalensis</i>
Mud?	Black-tail sergeant	<i>Abudefduf lorenzi</i>
	Yellow-axil chromis	<i>Chromis xanthochir</i>
	Yellow-tail sergeant	<i>Abudefduf notatus</i>
	Sergeant-major	<i>Abudefduf vaigiensis</i>
	Banded sergeant	<i>Abudefduf septemfasciatus</i>
	Scissor-tail sergeant	<i>Abudefduf sexfasciatus</i>
Kllibei	Black-spot sergeant	<i>Abudefduf sordidus</i>
	Golden damsel	<i>Amblyglyphidodon aureus</i>
	Staghorn damsel	<i>Amblyglyphidodon curacao</i>
	White-belly damsel	<i>Amblyglyphidodon leucogaster</i>
	Ternate damsel	<i>Amblyglyphidodon ternatensis</i>
	Two-spot demoiselle	<i>Chrysiptera biocellata</i>
	Blue devil	<i>Chrysiptera cyanea</i>
	Gray demoiselle	<i>Chrysiptera glauca</i>
	Surge demoiselle	<i>Chrysiptera leucopoma</i>
	Blue-spot demoiselle	<i>Chrysiptera oxycephala</i>
	King demoiselle	<i>Chrysiptera rex</i>
	Talbot's demoiselle	<i>Chrysiptera talboti</i>
	Tracey's demoiselle	<i>Chrysiptera traceyi</i>
	One-spot demoiselle	<i>Chrysiptera unimaculata</i>
	White-spot damsel	<i>Dischistodus chrysopoecilus</i>
	Back-vent damsel	<i>Dischistodus melanotus</i>
	White damsel	<i>Dischistodus perspicillatus</i>
	Giant farmer fish	<i>Hemiglyphidodon plagiometopon</i>
	Coral demoiselle	<i>Neopomacentrus nemurus</i>
	Fresh-water demoiselle	<i>Neopomacentrus taeniurus</i>
	Royal damsel	<i>Neoglyphidodon melas</i>
	Yellowfin damsel	<i>Neoglyphidodon nigroris</i>

	Dick's damsel	<i>Plectroglyphidodon imparipennis</i>
	Bright-eye damsel	<i>Plectroglyphidodon imparipennis</i>
	Johnston Island damsel	<i>Plectroglyphidodon johnstonianus</i>
	Jewel damsel	<i>Plectroglyphidodon lacrymatus</i>
	White-band damsel	<i>Plectroglyphidodon leucozonus leucozonus</i>
Mud	Ambon damsel	<i>Pomacentrus amboinensis</i>
	Speckled-fin damsel; Nagasaki damsel	<i>Pomacentrus nagasakiensis</i>
	Speckled damsel	<i>Pomacentrus bankanensis</i>
	Burrough's damsel	<i>Pomacentrus burroughi</i>
	Neon damsel	<i>Pomacentrus coelestis</i>
	White-tail damsel	<i>Pomacentrus chrysurus</i> (<i>p.rhodonotus</i> ; <i>P.flavicauda</i> ?)
	Outer-reef damsel	<i>Pomacentrus emarginatus</i>
	Blue-spot damsel	<i>Pomacentrus grammorhynchus</i>
	Lemon damsel	<i>Pomacentrus moluccensis</i>
	Black-axil damsel	<i>Pomacentrus nigromanus</i>
	Sapphire damsel	<i>Pomacentrus pavo</i>
	Reid's damsel	<i>Pomacentrus reidi</i>
	Blueback damsel	<i>Pomacentrus simsiang</i>
	Dusky damsel	<i>Pomacentrus sp.</i>
	Princess damsel	<i>Pomacentrus vaiuli</i>
	White-bar Gregory	<i>Stegastes albifasciatus</i>
	Pacific Gregory	<i>Stegastes fasciolatus</i>
	Blunt snout Gregory; Farmerfish	<i>Stegastes lividus</i>
	Dusky farmerfish	<i>Stegastes nigricans</i>
Cher	Six-banded	<i>Euxiphipops sextriatus</i>
Ngemngumk		<i>Euxiphipops xanthometapon</i>
	Wrasses	Labridae
	Axilspot hogfish	<i>Bodianus axillaries</i>
	Two-spot slender hogfish	<i>Bodianus bimaculatus</i>
	Diana's hogfish	<i>Bodianus Diana</i>
	Mesothorax hogfish	<i>Bodianus mesothorax</i>
Budech; Eitin	Yellow-cheeked tuskfish	<i>Choerodon anchorago</i>
Budech		<i>Choerodon azurio</i>
Udoudungelel	Chiseltooth wrasse	<i>Pseudodax moluccanus</i>
	Arenatus wrasse	<i>Cheilinus arenatus</i>
	Twospot wrasse	<i>Cheilinus bimaculatus</i>
	Celebes wrasse	<i>Cheilinus celebecus</i>
	Floral wrasse	<i>Cheilinus chlorourus</i>
	Bandcheeck wrasse	<i>Cheilinus digrammus</i>
Kerdeu	Red-breasted wrasse	<i>Cheilinus fasciatus</i>
Adeyaoch	Tripletail wrasse	<i>Cheilinus trilobatus</i>
Ngimr (sm), Didmecheilmaml	Humphead wrasse	<i>Cheilinus undulates</i>
	Ringtail wrasse	<i>Cheilinus unifasciatus</i>
	Black-spot pigmy wrasse	<i>Wetmorella nigropinnata</i>
Ngerengerodl	Slingjaw wrasse	<i>Epibulus insidiator</i>
	Slingjaw wrasse	<i>Epibulus insidiator</i>
	Dragon wrasse; Rockmover wrasse	<i>Novaculichthys taeniourus</i>
	Blueside wrasse	<i>Cirrhilabrus cyanopleura</i>
	Exquisite wrasse	<i>Cirrhilabrus exquisitus</i>
	Striated wrasse	<i>Pseudocheilinus evanidus</i>

	Sixline wrasse	<i>Pseudocheilinus hexataenia</i>
	Eighline wrasse	<i>Pseudocheilinus octotaenia</i>
	Cryptic wrasse	<i>Pterogogus cryptus</i>
	Sneaky wrasse	<i>Pterogogus guttatus</i>
	Blue-spotted wrasse	<i>Anampses caeruleopuntatus</i>
Udoudungelel	Black-spot gigmy wrasse?	<i>Anampses caeruleopuntatus</i>
	Geographic wrasse	<i>Anampses geographicus</i>
	White-spotted wrasse	<i>Anampses melanurus</i>
	Yellowtail wrasse	<i>Anampses meleagrides</i>
	Yellow-breasted wrasse	<i>Anampses twisti</i>
Ngiut	Cigar wrasse	<i>Cheilio inermis</i>
Uluch	Clown coris	<i>Coris aygula</i>
Dudalm	Yellowtail coris	<i>Coris gaimard</i>
	Dapple coris	<i>Coris variegata</i>
Merirchesengl	Bird wrasse	<i>Gomphosus varius</i>
	Two-spotted wrasse	<i>Halichoeres biocellatus</i>
	Pastel-green wrasse	<i>Halichoeres chloropterus</i>
	Checkerboard wrasse	<i>Halichoeres hortulanus</i>
	Weedy surge wrasse	<i>Halichoeres margaritaceus</i>
	Dusky wrasse	<i>Halichoeres marginatus</i>
	Pinstriped wrasse	<i>Halichoeres melanurus</i>
	Black-ear wrasse	<i>Halichoeres melasmapomus</i>
	Two-tone wrasse	<i>Halichoeres prospeion</i>
	Richmond's wrasse	<i>Halichoeres richmondii</i>
	Zigzag wrasse	<i>Halichoeres scapularis</i>
	Three-spot wrasse	<i>Halichoeres trimaculatus</i>
	Barred thicklip	<i>Hemigymnus fasciatus</i>
	Half-and-half wrasse (juv.); Blackedge thicklip wrasse (adult)	<i>Hemigymnus melapterus</i>
	Leopard wrasse	<i>Macropharyngodon meleagris</i>
	Negros wrasse	<i>Macropharyngodon negrosensis</i>
	Yamashiro's wrasse	<i>Pseudocoris yamashiroi</i>
Tilobed rechomesangl	Red-shoulder wrasse	<i>Stethojulis bandanensis</i>
	Three-ribbon wrasse	<i>Stethojulis</i>
	Bluehead Wrasse	<i>Thalassoma amblycephalum</i>
	Sixbar wrasse	<i>Thalassoma hardwickii</i>
	Jansen's wrasse	<i>Thalassoma janseni</i>
	Crescent wrasse	<i>Thalassoma lunare</i>
	Sunset wrasse	<i>Thalassoma lutescens</i>
Sechiir(ma), Ngot(fe)	Surge wrasse	<i>Thalassoma purpureum</i>
	Five-stripe surge wrasse	<i>Thalassoma quinquevittatum</i>
	Christmas wrasse	<i>Thalassoma trilobatum</i>
	Wandering cleaner wrasse	<i>Diproctacanthus xanthurus</i>
	Tubelip wrasse	<i>Labrichthys unilineatus</i>
	Bicolor cleaner wrasse	<i>Labroides bicolor</i>
Tengadidik	Bluestreak cleaner wrasse	<i>Labroides dimidiatus</i>
	Black-spot cleaner wrasse	<i>Labroides pectoralis</i>
	Allen's wrasse	<i>Labropsis alleni</i>
	Micronesian wrasse	<i>Labropsis micronesica</i>
Sisir	Wrasse	<i>Halichoeres spp.</i>
Klsieb	Blackeye thicklip	<i>Hemigymnus melapterus</i>
Telebakl(ma), Ngot(fe)		<i>Thalassoma fuscum</i>
	Parrotfishes	<i>Scaridae</i>

Berdebed(sm), Kemedukl(lg)	Humphead parrotfish	<i>Bolbometopon muricatum</i>
	Bucktooth parrotfish; Stareye parrotfish	<i>Calotomus carolinus</i>
Dekedekuuked	Spinytooth parrotfish	<i>Calotomus spinidens</i>
Beadl, Ngesngis (ma)	Bicolor parrotfish	<i>Cetoscarus bicolor</i>
Ngiaoch	Pacific longnose parrotfish	<i>Hipposcarus longiceps</i>
Kesuu	Seagrass parrotfish	<i>Leptoscarus vaigiensis</i>
Mesekelatlebt	Ember parrotfish	<i>Scarus rubroviolaceus sp?</i>
	Filament-finned parrotfish	<i>Scarus altipinnis</i>
	Red parrotfish; bluechin parrotfish	<i>Scarus atropectoralis</i>
Besachelutengl	Bleeker's parrotfish	<i>Scarus bleekeri</i>
Ngemoil		<i>Scarus blotchi</i>
	Bower's parrotfish	<i>Scarus bowersi</i>
	Chameleon parrotfish	<i>Scarus bleekeri</i>
Mesekelat		<i>Scarus chlorodon</i>
	Turquoise-capped parrotfish	<i>Scarus dimidiatus</i>
	Festive parrotfish	<i>Scarus festivus</i>
	Yellowfin parrotfish	<i>Scarus flavipectoralis</i>
Mul	Forsten's parrotfish	<i>Scarus forsteni</i>
	Vermiculate parrotfish	<i>Scarus frenatus</i>
Telebakl, Chelobtechukl, Molokidubch (ma)	Blue-barred parrotfish	<i>Scarus ghobban</i>
Chotord		<i>Scarus gibbus</i>
Ngemoil, Chelebt, Butiliang	Roundhead parrotfish	<i>Scarus globiceps</i>
Ngyaoch(sm), Bergism (lg)		<i>Scarus harid</i>
	Java parrotfish/Yellowtail parrotfish	<i>Scarus hypselopterus</i>
Mesekelat		<i>Scarus lepidus</i>
Chotored	Steephead parrotfish	<i>Scarus microhinos</i>
Butliliang	Black parrotfish/Swarthy parrotfish	<i>Scarus niger</i>
Uloiltoachel, Butiliang (ma); Melemau	Dark-capped parrotfish	<i>Scarus oviceps</i>
	Greenthroat parrotfish	<i>Scarus prasiognathos</i>
	Palenose parrotfish	<i>Scarus psittacus</i>
	Quoy's parrotfish	<i>Scarus quoyi</i>
	Rivulated parrotfish	<i>Scarus rivulatus</i>
Mellemau	Redlip parrotfish	<i>Scarus rubroviolaceus</i>
	Yellowband parrotfish	<i>Scarus schlegeli</i>
Mesekelat, Ngesngis(ma)	Bi-color parrotfish	<i>Scarus sexvittatus</i>
Derbetelloi, Butliliang(ma)	Bullethead parrotfish	<i>Scarus sordidus</i>
	Pigmy parrotfish	<i>Scarus spinus</i>
	Pale-margined parrotfish	<i>Scarus n. sp.?</i>
Kiuid, Mengetaoch(ma)		<i>Scarus venosus</i>
Udoudungelel		<i>Scarus xanthochir</i>
	Mullet	Mugilidae
Chesau or Uluu	Squaretail	<i>Ellochelon vaigiensis</i>
Bilich(sm) Kelat (lg)	Fringelip mullet	<i>Crenimugil crenilabis</i>
	Ceram mullet	<i>Liza ceramensis</i>
	Giant scale mullet	<i>Liza melinoptera</i>
	Yellowtail mullet; Squaretail	<i>Liza vaigiensis</i>
lokedch		<i>Mugil ceramensis</i>
	Bluespot mullet	<i>Valemugil seheli</i>
	Threadfins	Polynemidae
Klakmil	Sixfeeler threadfin	<i>Polydactylus sexfilis</i>

	Barracudas	Sphyraenidae
	Sharpfin barracuda	<i>Sphyraena acutipinnis</i>
Mersoad(sm), Mordubch(m), Ai(lg)	Great barracuda	<i>Sphyraena barracuda</i>
Meai	Blackspot barracuda	<i>Sphyraena forsteri</i>
Meai	Blackfin barracuda	<i>Sphyraena genie</i>
	Arrow barracuda	<i>Sphyraena novaehollandiae</i>
Triidlmaml(lg)		<i>Sphyraena novaehollandiae</i>
	Sandperches	Pinguipedidae
	Latticed sandperch	<i>Parapercis clathrata</i>
	Cylindrical sandperch	<i>Parapercis cylindrical</i>
	Black-dotted sandperch	<i>Parapercis millipunctata</i>
	Blotchlip sandperch	<i>Parapercis xanthozona</i>
	Triplefins	Tripterygiidae
	Hooded triplefin	<i>Helcogramma capidata</i>
	Little hooded triplefin	<i>Helcogramma chica</i>
	Blennies	Blenniidae
	Highfin blenny	<i>Atrosalarias fuscus holomelas</i>
	Chestnut blenny	<i>Cirripectes castaneus</i>
	Spotted blenny	<i>Cirripectes fuscoguttatus</i>
	Flaming blenny	<i>Cirripectes perustus</i>
	Barred blenny	<i>Cirripectes polyzona</i>
	Sqiggly blenny	<i>Cirripectes quagga</i>
	Red-streaked blenny	<i>Cirripectes stigmaticus</i>
	Leopard blenny	<i>Exalias brevis</i>
	Bicolor blenny	<i>Ecsenius bicolor</i>
	Comical blenny	<i>Ecsenius opsifrontalis</i>
	Saddle blenny	<i>Ecsenius sellifer</i>
	Yaeyama blenny	<i>Ecsenius yaeyamaensis</i>
	Tail-barred rockskipper	<i>Entomacrodus caudofasciatus</i>
	Seale's rockskipper	<i>Entomacrodus cymatobiotus</i>
	Pearly rockskipper	<i>Entomacrodus striatus</i>
	Reef margin blenny	<i>Entomacrodus thalassinus thalassinus</i>
	Red-spotted blenny	<i>Blenniella chrysospilos</i>
	Rippled rockskipper	<i>Istiblennius edentulous</i>
	Lined	<i>Istiblennius lineatus</i>
	Blue-dashed rockskipper	<i>Istiblennius periophthalmus</i>
	Fowler's rockskipper	<i>Istiblennius fowleri</i>
	Snow's rockskipper	<i>Rhabdoblennius snowi</i>
	Jeweled blenny	<i>Rhabdoblennius fasciatus</i>
	Segmented blenny	<i>Salarias segmentatus</i>
	Spot-cheek blenny	<i>Salarias sp.</i>
	Seychelle's blenny	<i>Stanulus seychellensis</i>
	Mangrove blenny	<i>Omobranchus rotundiceps obliquus</i>
	Omx blenny	<i>Omx biporos</i>
	Lance blenny	<i>Aspidontus dussumieri</i>
	Cleaner mimic	<i>Aspidontus taeniatus taeniatus</i>
	Poison-fang blenny	<i>Meiacanthus atrodorsalis</i>
	Striped poison-fang blenny	<i>Meiacanthus grammistes</i>
	Poison-fang blenny mimic	<i>Plagiotremus laudandus laudandus</i>
	Bluestriped blenny	<i>Plagiotremus rhynorhynchus</i>
	Piano blenny; Scale-eating blenny	<i>Plagiotremus tapiensoma</i>
	Striped poison-fang blenny mimic	<i>Petroscirtes breviceps</i>

	Floral blenny	<i>Petroscirtes mitratus</i>
	Thepa's sabretooth blenny	<i>Petroscirtes thepasi</i>
	Variable sabretooth blenny	<i>Petroscirtes variabilis</i>
	Xestus sabretooth blenny	<i>Petroscirtes xestus</i>
	Japanese snake blenny	<i>Xiphasia matsubarai</i>
	Dragonets	<i>Callionymidae</i>
	Tentacled dragonet	<i>Anaora tentaculata</i>
	Delicate dragonet	<i>Callionymus delicatulus</i>
	Mangrove dragonet	<i>Callionymus enneactis</i>
	Simple-spined dragonet	<i>Callionymus simplicicornis</i>
	Goram dragonet	<i>Diplogrammus goramensis</i>
	Ladd's dragonet	<i>Synchiropus laddi</i>
	Morrison's dragonet	<i>Synchiropus morrisoni</i>
	Ocellated dragonet	<i>Synchiropus ocellatus</i>
	Mandarinfish	<i>Synchiropus splendidus</i>
	Dartfishes; Hovergobies; wormfishes	<i>Microdesmidae</i>
	Onespot wormfish	<i>Gunnellichthys monostigma</i>
	Onestripe wormfish	<i>Gunnellichthys pleurotaenia</i>
	Seychelle's wormfish	<i>Paragunnellichthys seychellesnsis</i>
	Blackfin dartfish	<i>Ptereleotris evides</i>
	Pearly dartfish	<i>Ptereleotris microlepis</i>
	Decorated dartfish	<i>Nemateleotris decora</i>
	Helfrich's dartfish	<i>Nemateleotris helfrichi</i>
	Fire dartfish; Fire goby	<i>Nemateleotris magnifica</i>
	Beautiful hover goby	<i>Parioglossus formosus</i>
	Lined hover goby	<i>Parioglossus lineatus</i>
	Naked hover goby	<i>Parioglossus nudus</i>
	Palustris hover goby	<i>Parioglossus palustris</i>
	Rainford's hover goby	<i>Parioglossus raifordi</i>
	Taeniatus hover goby	<i>Parioglossus taeniatus</i>
	Gobies	<i>Gobiidae</i>
	Giant prawn-goby	<i>Amblyeleotris fontaseni</i>
	Spotted prawn-goby	<i>Amblyeleotris guttata</i>
	Randall's prawn-goby	<i>Amblyeleotris randalli</i>
	Steinitz' prawn-goby	<i>Amblyeleotris steinitzi</i>
	Banded prawn-goby	<i>Cryptocentrus cinctus</i>
	Blue-speckled prawn-goby	<i>Cryptocentrus octafasciatus</i>
	Singapore prawn-goby	<i>Cryptocentrus singaporensis</i>
	Gold-streaked prawn goby	<i>Ctenogobiops aurocingulus</i>
	Ornate prawn-goby	<i>Vanderhorstia ornatissima</i>
	Corsshatch goby	<i>Amblygobius decussatus</i>
	Hector's goby	<i>Amblygobius hectori</i>
	Old glory; Rainford's goby	<i>Amblygobius rainfordi</i>
	Blue-spotted hole goby	<i>Oplopomus oplopomus</i>
	Signal goby; Crab-eye goby	<i>Signigobius biocellatus</i>
	Mural goby	<i>Valenciennea muralis</i>
	Blue-streak goby	<i>Valenciennea strigata</i>
	Mangrove goby	<i>Acentrogobius sp.</i>
	Dudky frill-goby	<i>Bathygobius fuscus fuscus</i>
	Gorgonian goby	<i>Bryaninops amplus</i>
	Whip coral goby	<i>Bryaninops youngei</i>
	Hasselt's goby	<i>Callogobius hasselti</i>
	Spotted fringe-fin goby	<i>Eviota albolineata</i>

	Comet pygmy goby	<i>Eviota cometa</i>
	Twospot pygmy goby	<i>Eviota distigma</i>
	Barred pygmy goby	<i>Eviota fasciola</i>
	Herre's pygmy goby	<i>Eviota herrei</i>
	Infulata pygmy goby	<i>Eviota infulata</i>
	Lachdebrere's pygmy goby	<i>Eviota lachdeberei</i>
	Melasma pygmy goby	<i>Eviota melasma</i>
	Nebulous pygmy goby	<i>Eviota nebulosa</i>
	Green bubble goby	<i>Eviota prasina</i>
	Pepperfin pygmy goby	<i>Eviota punctulata</i>
	Queensland pygmy goby	<i>Eviota queenslandica</i>
	Saipan pygmy goby	<i>Eviota saipanensis</i>
	Speckled pygmy goby	<i>Eviota sparsa</i>
	Storthynx pygmy goby	<i>Eviota storthynx</i>
	Zoned pygmy goby	<i>Eviota zonura</i>
	Mud reef-goby	<i>Eviota belissimus</i>
	Common fusegoby	<i>Fusigobius neophytes</i>
	Gladiator goby	<i>Gladigobius ensifer</i>
	Eyebar goby	<i>Gnatholepis cauerensis</i>
	Whitelined coral goby	<i>Gobiodon albofasciatus</i>
	Lemon coral goby	<i>Gobiodon citrinus</i>
	Yellow coral goby	<i>Gobiodon okinawae</i>
	Five-lined coral goby	<i>Gobiodon quinquestrigatus</i>
	Rippled coral goby	<i>Gobiodon rivulatus</i>
	Bravo's bearded goby	<i>Gobiopsis bravoii</i>
	Ornate goby	<i>Istigobius ornatus</i>
	Largetooth goby	<i>Macrodontogobius wilburi</i>
	Blackfin coral goby	<i>Paragobiodon lacunicolus</i>
	Black coral goby	<i>Paragobiodon melanosomus</i>
	Common mudskipper	<i>Periophthalmus kalolo</i>
	Barred mudskipper	<i>Periophthalmus argentilineatus</i>
	Bilobed ghost goby	<i>Pleurosicya bilobatus</i>
	Ghost goby	<i>Priolepis semidoliata</i>
	Half-barred goby	<i>Priolepis semidoliata</i>
	Tevega cave goby; Blue-striped cave goby	<i>Trimma tevegae</i>
	Tevega cave goby; Blue-striped cave goby	<i>Trimma tevegae</i>
	Flatfishes(flounders;soles)	<i>Pleuronectiformes</i>
	Lefteye flounders	<i>Bothidae</i>
Rrai	Peacock flounder	<i>Bothus mancus</i>
Rrai	Leopard flounder	<i>Bothus pantherinus</i>
	Soleidae	<i>Soles</i>
	Peacock sole	<i>Pardachirus pavoninus</i>
	Tunas; Mackerels	<i>Scomboidei</i>
	Snake Mackerels	<i>Gempylidae</i>
Telouchedui	Roudi escolar	<i>Promethichthys Prometheus</i>
	Cutlassfishes	<i>Trichiuridae</i>
Telouchedui		<i>Trichiurus lepturus</i>
	Tunas & Mackerels	<i>Scombridae</i>
Keskas or Mersad	Wahoo	<i>Acanthocybium solanderi</i>
Chesodm	Frigate tuna	<i>Auxis thazard</i>
Chesodm, Soda katsuo	Kawakawa	<i>Euthynnus affinis</i>

Mokorokor; Biturturch		<i>Grammatorcynus bicarinatus</i>
Biturturch	Double-lined mackerel	<i>Grammatorcynus bilineatus</i>
Kerengob	Dogtooth tuna	<i>Gymnosarda unicolor</i>
Katsuo, Mokorokor	Skip-jack tuna	<i>Katsuwonus pelamis</i>
Smaach	Indian mackerel	<i>Rastrelliger kannagurta</i>
	Striped mackerel; short mackerel	<i>Rastrelliger brachysoma</i>
Smaach	Chub mackerel	<i>Scomber japonicus</i>
Ngelngal	Narrow-barred king mackerel	<i>Scomberomus commerson</i>
Tekuu, Manguro	Yellow-fin Tuna	<i>Thunnus albacares</i>
	Billfishes	<i>Istiophoridae</i>
Meluis	Indo-Pacific sailfish	<i>Istiophorus platypterus</i>
Tekrar	Black Marlin	<i>Makaira indica</i>
	Broadbill swordfish	<i>Xiphiidae</i>
Meluis?		<i>Xiphias gladius</i>
	Helmet gurnards; Flatheads	<i>Scorpaeniformes</i>
Koklbetaot	Helmet Gurnards	<i>Dactylopteridae</i>
	Common helmet gurnard	<i>Dactyloptena orientalis</i>
	Flatheads	<i>Platycephalidae</i>
	Crocodile fish	<i>Cymbacephalus beauforti</i>
Debribr	Broadhead flathead	<i>Platycephalus arenicola</i>
Debribr	Fingelip flathead	<i>Platycephalus otaitensis</i>
	Coral Crouchers	<i>Caracanthidae</i>
	Spotted coral croucher	<i>Caracanthus maculatus</i>
	Pygmy coral croucher	<i>Caracanthus unipinna</i>
	Waspfishes	<i>Tetrarogidae</i>
	Mangrove waspfish	<i>Tetraroge barbata</i>
	Scorpionfishes	<i>Scorpaenidae</i>
	McAdam's scorpionfish	<i>Parascorpaena mcadamsi</i>
	Mozambique scorpionfish	<i>Parascorpaena mossambica</i>
Chesechid	Lionfish	<i>Pterois spp.</i>
	Yellowspotted scorpionfish	<i>Sebastapistes cyanostigma</i>
Koklobetaot		<i>Scorpaena spp.</i>
	Hairy scorpionfish	<i>Scorpaenodes hirsutus</i>
	Kellog's scorpionfish	<i>Scorpaenodes kelloggi</i>
	Coral scorpionfish	<i>Scorpaenodes parvipinnis</i>
	Blotchin scorpionfish	<i>Scorpaenodes varipinis</i>
	Guam scorpionfish	<i>Scorpaenodes guamensis</i>
Koklbetaot	Devil scorpionfish	<i>Scorpaenopsis diabolus</i>
Koklbetaot	Flasher scorpionfish	<i>Scorpaenopsis macrochir</i>
Koklbetaot	Pigmy scorpionfish	<i>Scorpaenopsis fowleri</i>

Koklbetaot	Tassled scorpionfish	<i>Scorpaenopsis oxycephala</i>
Koklbetaot	Spiny crown scorpionfish	<i>Scorpaenopsis sp.</i>
	Weedy scorpionfish	<i>Rhinopias frondosa</i>
Smuuch or Louch	Stonefish	<i>Synanceia verrucosa</i>
	Spiny devilfish	<i>Inimicus didactylus</i>
Louch	Leaf fish	<i>Taenianotus triacanthus</i>
	Ocellated lionfish	<i>Dendrochirus biocellatus</i>
	Zebra lionfish	<i>Dendrochirus zebra</i>
	Spotfin lionfish	<i>Pterois antennata</i>
	Clearfin lionfish	<i>Pterois radiata</i>
	Lionfish; Turkeyfish	<i>Pterois volitans</i>
	Catfishes	Siluriformes
	Eel catfishes	Plotosidae
	Striped eel catfish	<i>Plotosus lineatus</i>
	Trumpetfishes; cornetfishes	Syngnathiformes
	Trumpetfishes/umpetfishes	Aulostomidae
	Trumpet fishes	<i>Aulostomus chinensis</i>
	Cornetfishes	Fistularidae
	Cornetfish; Smooth flutemouth	<i>Fistularia commersonii</i>
Ulach or Ulachmerand		<i>Fistularia petimba</i>
	Shrimpfishes	Centriscidae
	Shrimpfishes	<i>Aeoliscus strigatus</i>
	Pipefishes & Seahorses	Syngnathidae
	Yellow seahorse	<i>Hippocampus kuda</i>
	Naked pipefish	<i>Bhanotia nuda</i>
	Pugheaded pipefish	<i>Bulbonaricus brauni</i>
	Shortbodied pipefish	<i>Choeroichthys brachysoma</i>
	Sculpted pipefish	<i>Choeroichthys sculptus</i>
	Network pipefish	<i>Choeroichthys flavofasciatus</i>
	Pipefish	<i>Corythochthys haematopterus</i>
	Scribbled pipefish	<i>Corythochthys intestinalis</i>
	Black-breasted pipefish	<i>Corythochthys nigripectus</i>
	Ocellated pipefish	<i>Corythochthys ocellatus</i>
	Many-spotted pipefish	<i>Corythochthys polynotatus</i>
	Guided pipefish; Schultz' pipefish	<i>Corythochthys schultzi</i>
	Bluestrip pipefish	<i>Doryhamphus excisus excisus</i>

	Jan's pipefish	<i>Doryrhamphus janssi</i>
	Negros pipefish	<i>Doryrhamphus negrosensis negrosensis</i>
	Banded pipefish	<i>Doryrhamphus (Dunkerocampus) dactyliophorus</i>
	Duncker's pipefish	<i>Halicampus dunckeri</i>
	Glittering pipefish	<i>Halicampus nitidus</i>
	Anderson's short-nosed pipefish	<i>Micrognathus andersonii</i>
	Pygmy short-nosed pipefish	<i>Micrognathus brevirostris pygmaeus</i>
		<i>Phoxocampus diacanthus</i>
		<i>Syngnathoides biaculeatus</i>
	Triggerfishes; Filefishes; Trunkfishes; Puffers; Porcupine fishes	Tetraodontiformes
	Triggerfishes	Balistidae
	Starry triggerfish	<i>Abalistes stellan's</i>
Ilambrokl	Orangestriped triggerfish	<i>Balistapus undulates</i>
	Clown triggerfish	<i>Ballistoides conspicillum</i>
Tetachruchel, tangibtall		<i>Balistoides niger</i>
Beab	Mustache triggerfish; Titan triggerfish	<i>Balistoides viridescens</i>
	Spotted oceanic triggerfish	<i>Canthidermis maculates</i>
	Pinktail triggerfish	<i>Melichthys vidua</i>
	Redtooth triggerfish	<i>Odonus niger</i>
Cherakl, Dukl	Yellowmargin triggerfish	<i>Pseudobalistes flavimarginatus</i>
	Blue triggerfish; Rippled triggerfish	<i>Pseudobalistes fuscus</i>
Tungch	Picassofish; Humuhumu	<i>Rhinecanthus rectangulus</i>
Tungch	Wedge picassofish; Humuhumu	<i>Rhinecanthus rectangulus</i>
Tungch	Blackbelly picassofish	<i>Rhinecanthus verrucosus</i>
Tungch	Scythe triggerfish; Boomerang triggerfish	<i>Sufflamen bursa</i>
	Halfmoon triggerfish	<i>Sufflamen chrysoptera</i>
	Bridle triggerfish	<i>Sufflamen freanatus</i>
Tungch	Picaso triggerfish	<i>Sufflamen niger</i>
	Bluechin triggerfish (male); Guilded triggerfish	<i>Xanthichthys auromarginatus</i>
	Filefishes	Monacanthidae
	Seagrass filefish	<i>Acreichthys tomentosus</i>
Lung	Scribbled filefish	<i>Aluterus scriptus</i>
	Broom filefish	<i>Amanses scopes</i>
	Barred filefish	<i>Cantherhines dumerilii</i>
Yalk	Wire-net filefish	<i>Cantherhines pardalis</i>

Moichall	Longnose filefish	<i>Oxymonacanthus longirostris</i>
	Blacksaddle mimic	<i>Paraluteres prionurus</i>
	Blackbar filefish	<i>Pervagor janthinosoma</i>
	Blackheaded filefish	<i>Pervagor nigrolineatus</i>
	Trunkfishes	<i>Ostraciidae</i>
Karamasus		<i>Lactoria cornutas</i>
Bebeu(sm); Riamel(lg)	Cube trunkfish	<i>Ostracion cubicus</i>
	Spotted trunkfish	<i>Ostracion meleagris</i>
	Reticulate boxfish	<i>Ostracion solorensis</i>
	Smallnose boxfish	<i>Rhynchostracion nasus</i>
	Puffers	<i>Tetraodontidae</i>
	Whitespotted puffer	<i>Arothron hispidus</i>
	Narrow-lined puffer	<i>Arothron manilensis</i>
	Map puffer	<i>Arothron mappa</i>
	Guineafowl puffer	<i>Arothron meleagris</i>
Telbudel	Blackspotted puffer	<i>Arothron nigropunctatus</i>
Tiaueltelbudel	Star puffer	<i>Arothron stellatus</i>
	Ambon sharpnose puffer	<i>Canthigaster amboinensis (C. natalensis)</i>
	Bennet's sharpnose puffer	<i>Canthigaster bennetti</i>
	Fingerprint sharpnose puffer	<i>Canthigaster compressa</i>
	Crowned sharpnose puffer	<i>Canthigaster coronata</i>
		<i>Canthigaster epilampra</i>
		<i>Canthigaster janthinoptera</i>
	Spotted sharpnose puffer	<i>Canthigaster solandri</i>
	Valentinni's sharpnose puffer	<i>Canthigaster valentini</i>
	Porcupinefishes	<i>Diodontidae</i>
Drutm	Porcupinefish	<i>Diodon hystrix</i>
Drutm	Spiny balloonfish	<i>Diodon holacanthus</i>
	Shortspine porcupinefish	<i>Diodon liturosus</i>

Marine Invertebrates

Obtained from Matthews & Oiterong (1991) "The Role of Women in the Fisheries of Palau"

*** not in appropriate taxonomic order

Palauan	Common	Scientific
		Phylum Porifera (sponges)
Rurout		?
	NOTE: list of corals is found in a separate file.	Phylum Cnidaria (corals & jellyfishes)
Bung	Sea anemone	?
Chetermall	Sand colored sea anemone	Stoichactis japonicus
Chetermall		Stoichactis haddoni
Olaunmeas	Sea anemone	<i>Actiiodendron plumosum</i>
Chedeade	Mastigias jellyfish	Mastigias sp.
Chedeade	Moon jellyfish	Aurelia sp.
		Phylum Sipincula (unsegmented marine worms)
Chiull		
Ngimer		
		Phylum Rhynchozoela (Nemerteans) (Proboscis worms or ribbon worms)
?		?
		Phylum Annelida (segmented worms)
		Phylum Mollusca
		Class Bivalvia (clams & oysters)
Chebau	Lettered venus	Tapes literata
Chedalngobel	Yellow pitar venus	Pitar citrina
Kerdaob	Youthful venus sand clam	Periglypta puerpera
Chesechol	Nut clam	Actoodea striata
Delbekai	Nut clam	<i>Nucula rugosa</i>
	Nut clam	Gafrarium tumidum
Chesechur		Trachycardium flavum
Rrudel	Oyster	Pteria penguin
Chesiuch	Black lip pearl oyster	Pinctada margaritifera
Iud	Rock oyster	Ostrea glomerata
Tiuach	Black or Brown common hammer oyster	Malleus malleus
Uteuetech	Oyster	Chama buddiana
Uteuetech	Oyster	Chama sinuosa
Delal a ngduul		Anodonita alba
Delal a ngduul		Adonita philippina
Ngduul		Anodonita edulenta
Eduib or Debuongel (found in Melekeok only?)	Mangrove clam	Polymeseda luhuana
Ilekum	Interrupted lucina	Codakia interrupta

<i>Kdor (found in east. Bab. Only?)</i>		<i>Tellina virgata</i>
<i>Dekmus</i>	Donkey's ear abalone	<i>Haliotis asinina</i>
<i>Dekmus</i>	Sheep's ear abalone	<i>Haliotis ovina</i>
<i>Duadeb (Kim)</i>	Giant clam	<i>Hippoppus hippopus</i>
<i>Oruer</i>	Giant clam	<i>Tridacna crocea</i>
<i>Kism</i>	Giant clam	<i>Tridacna derasa</i>
<i>Otkang</i>	Giant clam	<i>Tridacna gigas</i>
<i>Melibes</i>	Giant clam	<i>Tridacna maxima</i>
<i>Ribkungal</i>	Giant clam	<i>Tridacna squamosa</i>
	Giant clam	<i>Tridacna sp.</i>
<i>Kim ra rechelid</i>		<i>Ostrea hyotis</i>
<i>Kim ra rechelid</i>		<i>Ostrea crista-galli</i>
<i>Olichel a sechou</i>	Pen shells	<i>Pinna spp.</i>
<i>Sebuis</i>	IndoPacific pen shell	<i>Atrina vexillum</i>
		<i>Nerita maxima</i>
<i>Delsangel</i>		<i>Nerita undata</i>
<i>Kikoi</i>	Ark shell	<i>Andara spp.</i>
<i>Kikoi</i>	Ark shell	<i>Barbatia reeveana</i>
<i>Buich</i>	Cowrie	<i>Cypraea tigris</i>
<i>Sang</i>	Spider shell	<i>Lambis lambis</i>
<i>Ototl</i>		<i>Conus spp.</i>
		Class Gastropoda (conches, limpets & nudibranchs)
<i>Kedarm</i>	Nautilus	<i>Nautilus belauensis</i>
<i>Bsungel</i>	Snails smaller than delsangel found in brackish mangrove water	<i>Terebralia semestriata</i>
<i>Buich</i>	Tiger cowrie	<i>Cypraea tigris</i>
<i>Debusech</i>	Trumpet triton	<i>Charonia tritonis</i>
<i>Delsangel</i>		<i>Nerita maxima</i>
<i>Delsangel</i>		<i>Nerita undata</i>
<i>Ibusech</i>	Giant murex	<i>Chicoreus ramosus</i>
<i>Itungel</i>	Snails smaller than delsangel found on rocks on beaches	?
<i>Murech</i>	Turreted nerite	<i>Neritina turrita cumingiana</i>
<i>Omuu</i>	Horned helmet	<i>Cassis cornuta</i>
<i>Ototel</i>	Cone shell	<i>Conus spp.</i>
<i>Rechiil</i>	Sm. White conch	<i>Strombus gibberulus</i>
<i>Sang</i>	Spider shell	<i>Lambis lambis</i>
<i>Sang ra Roech</i>	Spider shell	<i>Lambis chiragra</i>
<i>Semachel</i>	Blood-mouthed conch	<i>Strombus luhuanus</i>
<i>Semal or Itol</i>	Sea hare	<i>Dolabella sp.</i>
<i>Sumum or Okeok</i>	Top shell snail	<i>Trochus niloticus</i>
		Class Cephalopoda (octopus & squids)

<i>Bukitang</i>	Octopus	<i>Polypus spp.</i>
<i>Luut</i>	Squid	<i>Loligo sp.</i>
<i>Milengoll</i>	Cuttlefish	<i>Sepia latimanus</i>
		Class Polycophora (chitons)
<i>Chechui</i>	Chiton	<i>Chiton tuberculatus ?</i>
<i>Chechui</i>	Chiton	<i>Acanthopleura sp. ?</i>
		Phylum Echinodermata (starfish, sea urchins, sea cucumbers)
		Class Stelleroidea
<i>Btuch ra doab</i>	starfish	Subclass Asteroidea (starfish)
<i>Btuch ra doab</i>	starfish	Subclass Ophiuroidea (brittle stars)
		Class Echinoidea (Sea urchins)
<i>Ibuchel</i>	Sea urchin	<i>Tripneustes gratilla</i>
<i>Ibuchel</i>	Sea urchin	<i>Hemicentrotus pulcherrimus</i>
<i>Ibuchel</i>	Sea urchin	<i>Strongylocentrotus pileolus</i>
<i>Choalech</i>	Sea urchin	<i>Diadema setosum</i>
<i>Duduomel</i>	Sea urchin	<i>Toxopneustes pileolus</i>
		Class Holothuroidea
<i>Cheremrum</i>	Sea Cucumber	<i>Actinopyga miliaris</i>
<i>Cheremrum</i>	Sea Cucumber	<i>Actinopyga echinites</i>
<i>Meremarech</i>	Sea Cucumber	<i>Bohadschia argus</i>
<i>Choas</i>		<i>Holothuria atra</i>
<i>Sengill</i>		<i>Holothuria flavomaculata</i>
<i>Delal a Molech</i>	Sea Cucumber	<i>Holothuria fuscopunctata</i>
<i>Bakelungall</i>		<i>Holothuria nobilis</i>
<i>Molech</i>	Sea Cucumber	<i>Holothuria scabra</i>
<i>Irimd</i>	Sea Cucumber	<i>Holothuria sp.</i>
<i>Sekesakel (or Teketekoel in Ngerchelong)</i>	Sea Cucumber	<i>Holothuria verrucosa</i> or <i>H. impatiens?</i>
<i>Chederngor</i>		<i>Holothuria difficilis</i>
<i>Ngimes</i>	Sea Cucumber	<i>Stichopus variegatus</i>
<i>Temtamel</i>	Beche de mer	<i>Thelenota ananas</i>
		Class Crinoidea (sea lilies)
		Phylum Arthropoda (crabs & shrimps)
		Class Crustacea
	Barnacles	
	Copepods	
<i>Chelauesachel</i>	Mantis shrimp	?
<i>Cheleched</i>		<i>Thalamitoides tridens</i>
<i>Cheleched</i>		<i>Thalamitoides spinimana</i>
<i>Cheleched</i>		<i>Thalamitoides danae</i>
<i>Chemang</i>		<i>Scylla serrata</i>
<i>Cherabrukl</i>	Spiny lobsters & crayfish	<i>Panulirus spp.</i>
<i>Raiklius</i>		<i>Panulirus penicillatus</i>
<i>Bleached</i>		<i>Panulirus versicolor</i>
<i>Melech</i>		<i>Panulirus longipes</i>

<i>Cheramrou</i>	Crayfish	<i>Laemedia astacina</i>
<i>Cheramrou</i>		<i>Thalassina anomala</i>
<i>Cherechur</i>	Shrimp	?
<i>Chesechuul</i>	Sand crab	?
<i>Kidl</i>	Red spot rock crab	<i>Carpiliuss maculatus</i>
<i>Kmai</i>	Blue spot rock crab	<i>Portunus pelagicus</i>
<i>Ksull</i>		<i>Paraxanthia elegans (or)</i>
<i>Ksull</i>		<i>Xanthias lividus</i>
<i>Ksull</i>		<i>Atergatopsis signatus</i>
<i>Rekung, rekung el beab, o r rekung kakum</i>		<i>Cardisoma hirtipes</i>
<i>Rekung el daob</i>		<i>Cardisoma carnifex</i>
<i>Rereek</i>	Black rock crab	<i>Grapsus tenuicrustatus</i>
<i>Senges</i>	Gray crab w/ square body	<i>Neopisesarma lafondi</i>

Hard Corals of Palau

Obtained from Richard Randal's Reef Building Corals in the Marianas and Palau... (1995) of 385 hard coral species collected (so may not include all coral species in Palau)

Palauan	Common	Scientific	Biological Status (Endemic, Native Introduced, etc.)
<i>Merand - all corals</i>		Order SCLERACTINIA	
<i>Badelchei - Porites</i>		ASTROCOENIIDAE (2 spp.)	
<i>Sond - branching coral</i>		<i>Stylocoeniella</i>	
		THAMNASTERIIDAE (12 spp)	
		<i>Psammocora</i>	
		POCILLOPORIDAE (19 spp.)	
		<i>Seriatopora</i>	
		<i>Stylophora</i>	
		<i>Palauastrea</i>	
		<i>Pocillopora</i>	
		<i>Madracis</i>	
		ACROPORIDAE (127 spp.)	
		<i>Acropora</i>	
		<i>Anacropora</i>	
		<i>Astreopora</i>	
		<i>Montipora</i>	
		AGARICIIDAE (31 spp.)	
		<i>Pavona</i>	

		<i>Gardineroseris</i>	
		<i>Coeloseris</i>	
		<i>Leptoseris</i>	
		<i>Pachyseris</i>	
		SIDERASTREIDAE (2 spp.)	
		<i>Coscinaraea</i>	
		FUNGIIDAE (28 spp.)	
		<i>Cycloseris</i>	
		<i>Diaseris</i>	
		<i>Fungia</i>	
		<i>Heliofungia</i>	
		<i>Ctenactis</i>	
		<i>Herpolitha</i>	
		<i>Polyphyllia</i>	
		<i>Sandalolitha</i>	
		<i>Lithophyllon</i>	
		<i>Podabacia</i>	
		PORITIDAE (44)	
		<i>Porites</i>	
		<i>Stylaraea</i>	
		<i>Goniopora</i>	
		<i>Gonipora</i>	
		<i>Alveopora</i>	
		FAVIIDAE (60)	
		<i>Caulastrea</i>	
		<i>Barabattoia</i>	
		<i>Favia</i>	
		<i>Favites</i>	
		<i>Goniastrea</i>	
		<i>Leptoria</i>	
		<i>Platygyra</i>	
		<i>Oulophyllia</i>	
		<i>Montastrea</i>	
		<i>Plesiastera</i>	
		<i>Diploastrea</i>	
		<i>Leptastrea</i>	
		<i>Cyphastrea</i>	
		<i>Echinopora</i>	
		OCULINIDAE (3)	
		<i>Galaxea</i>	
		<i>Acrhelia</i>	
		MERULINIDAE (8)	
		<i>Hydnophora</i>	
		<i>Merulina</i>	
		<i>Scapophyllia</i>	
		<i>Paraclavarina</i>	

		MUSSIDAE (14)	
		<i>Scolymia</i>	
		<i>Acanthastrea</i>	
		<i>Lobophyllia</i>	
		<i>Symphyllia</i>	
		PECTINIIDAE (10)	
		<i>Echinophyllia</i>	
		<i>Mycedium</i>	
		<i>Pectinia</i>	
		<i>Oxypora</i>	
		CARYOPHYLLIIDAE (7)	
		<i>Euphyllia</i>	
		<i>Plerogyra</i>	
		<i>Physogyra</i>	
		DENDROPHYLLIIDAE(6)	
		<i>Turbinaria</i>	
		Order COENOTHECALIA	
		HELIOPORIDAE (1)	
		<i>Helipora</i>	
		Order Stolonifera	
		TUBIPORIDAE (1)	
		<i>Tubipora</i>	
		Order MILLEPORINA	
		MILLEPORIDAE (10)	
		<i>Millepora</i>	

References

1 Maragos, J. E., *et al.* 1994. *Marine and Coastal Areas Survey of the Main Palau Islands: Part 2 - Rapid Ecological Assessment Synthesis Report*. Prepared by CORIAL and The Nature Conservancy, Honolulu, HI. 125 pp.

PALAU

DOMESTIC
FISHING

L A W S

2007



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Foreword

This information is presented to inform commercial and pleasure domestic fishermen about the national laws pertaining to fishing in domestic waters of the Republic of Palau. It does not include the state laws applying to fishing and the national laws applying to foreign fishing.

This document is not a legal text. References to the legal texts are given with each law cited. The full text of the laws and rules is available for review at the Bureau of Domestic Affairs (Phone: 767 2343). This information is current at the date of printing (April 2007) and subject to change. If questions arise concerning this document, please contact:

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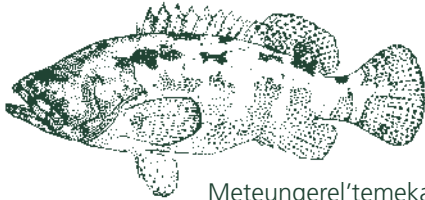
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Regulated species



Groupers

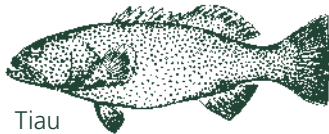
4



Meteungerel'temekai
(*Epinephelus fuscoguttatus*)



Ksau'temekai
(*Epinephelus polyphkadion*)



Tiau
(*Plectropomus areolatus*)



Mokas
(*Plectropomus laevis*)



Katuu'tiau
(*Plectropomus laevis*)



Tiau
(*Plectropomus leopardus*)

From April 1 to July 31 inclusive, it is against the law to fish for, sell, receive, export, cause to be exported, possess or buy any of the following species, regardless of where such species may have originated:

- meteungerel'temekai
(*Epinephelus fuscoguttatus*),
- ksau'temekai
(*Epinephelus polyphkadion*),
- tiau (*Plectropomus areolatus*),
- mokas, katuu'tiau (*Plectropomus laevis*),
- tiau (*Plectropomus leopardus*).

Ref. 27 PNCA 1204

Many coral reef fish, including groupers, aggregate in large numbers in specific locations, seasons and moon phases in order to spawn.

In several areas of the Pacific, groupers have been virtually eliminated because of intensive fishing of these spawning aggregations.

In Palau, spawning aggregations of groupers have been observed all year round. To protect them and make sure the groupers have a chance to reproduce in large numbers, it has been decided to completely close the fishery during the peak spawning aggregation period, from April 1 through July 31.

Groupers in Palau, as in many other places in the world, are considered to be amongst the most fascinating fish in the water. By respecting these regulations, we will give our grandchildren and the following generations the chance to know what groupers are like.

Rabbitfish

6



Meyas
(*Siganus fuscescens*)*

From February 1 to March 31 inclusive, it is against the law to fish for, sell, receive, export, cause to be exported, possess or buy rabbitfish (meyas, *Siganus canaliculatus**), regardless of where such species may have originated.

Ref. 27 PNCA 1204

* The scientific name of meyas has changed. It used to be *Siganus canaliculatus*; it is now *Siganus fuscescens*.

Rabbitfish (meyas) are herbivorous but they also occasionally feed on small invertebrates. They usually swim in schools in coral reef areas and shallow coastal waters.

The peak spawning season for rabbitfish in Palau waters is believed to last from the beginning of February to the end of March.

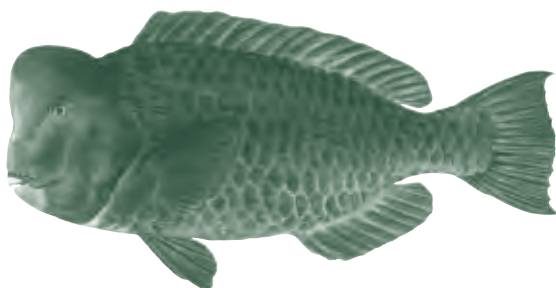
When a species is heavily exploited, the first and most efficient measure to take is to protect it while it reproduces.

In Palau, fishermen and scientists observed that the number of rabbitfish was declining. So it was decided to completely close the fishery, every year from February 1 to March 31 inclusive, when they spawn.



Humphead parrotfish

8



Kemedukl, berdebed,
fahorari hamaduhiri
(*Bolbometopon muricatum*)

It is against the law to fish for, sell, buy, receive, possess, export or cause to be exported any humphead parrotfish (kemedukl, berdebed; *Bolbometopon muricatum*), regardless of where such species may have originated.

Ref. 27 PNCA 1204

The humphead parrotfish (kemedukl, berdebed, fahorari hamaduhiri) lives in coral areas and feeds on corals and algae. It is the biggest of all parrotfish and some exceptional specimens have been reported to reach 55 inches and 165 pounds. It uses its hump to break the corals before crunching them with its teeth.

Humphead parrotfish grow slowly and take many years to become sexually mature (able to reproduce).

Several years ago, fishermen and divers could see them in very large schools. But, nowadays, they are only encountered occasionally and in small numbers, and scientists fear that their population might diminish to a critical point. This is the reason why it is now totally forbidden to fish for, possess or trade the humphead parrotfish, all year round.

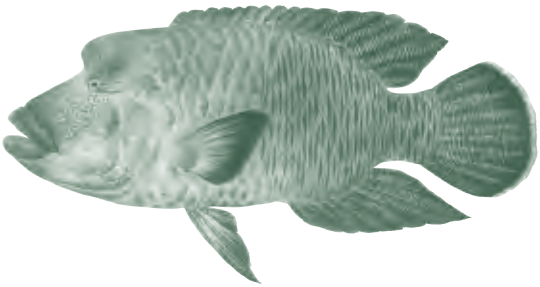


Napoleon wrasse

10



Ngimer
(*Cheilinus undulatus* - juvenile)



Maml
(*Cheilinus undulatus* - adult)

It is against the law to fish for, sell, buy, receive, possess, export or cause to be exported any Napoleon wrasse (ngimer, maml; *Cheilinus undulatus*), regardless of where such species may have originated.

Ref. 27 PNCA 1204

The Napoleon wrasse (ngimer, maml, fahorari mami) is a solitary fish that lives in the vicinity of coral reefs from shallow to deeper (20 fathoms) waters. It feeds mostly on shellfish such as urchins, crustaceans and molluscs. It can reach 80 inches and more than 280 pounds. It is the largest of all wrasses and one of the biggest of all coral reef fish in the world.

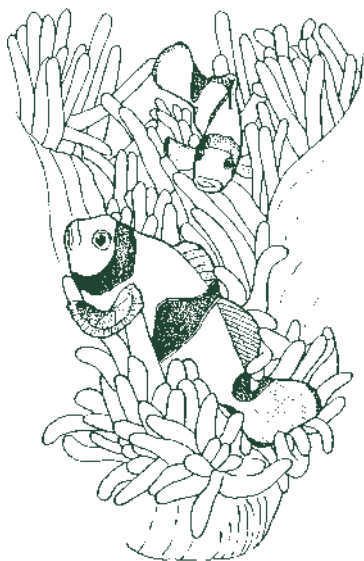
Like humphead parrotfish, Napoleon wrasses grow slowly and take many years to attain adult size, when they are able to reproduce.

Observations have shown that Palau's overall population of Napoleon wrasse has regularly declined in the past years, so it was decided to fully protect it. It is now totally forbidden to fish for, possess or trade the Napoleon wrasse, all year round.

A big Napoleon wrasse, alive in the wild, is a sight that divers from all over the world would like to see. As a diving attraction, a live Napoleon wrasse brings a lot of money to Palauan people. Let's hope that now that they are protected, their population will grow, allowing tourist divers and Palauan people to regularly encounter them.



Aquarium species



12

Aquarium species are defined in a list prepared by the Marine Resources Division and named in the Regulated Marine Species Register.

Any person who takes more than five (5) specimens or pieces of aquarium species in a single day must have an Aquarium Collecting Permit issued by the Minister or his designee.

Only Palauan citizens can apply for an Aquarium Collecting Permit.

No person may export aquarium species unless he has an Aquarium Collecting Permit or a Marine Research Permit issued by the Minister or his designee.

*Ref. 27 PNCA 1205, 1206
and Regulations on the Collection of
Marine Resources for Aquaria and Research*

Aquarium species include dozens of fish species but also anemones, jellyfish, sponges, crustaceans, and molluscs.

They are usually the first species encountered by snorkelers in shallow waters and as such, they are extremely important to the tourist industry of Palau.

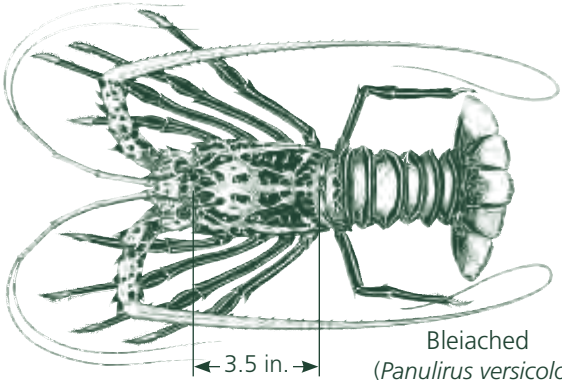
However, if carefully managed, a sustainable industry based on the collection of aquarium species can be developed. To control the number of people entering this fishery, a system of permits has been put in place. At present, a maximum of twenty (20) Aquarium Collecting Permits can be issued every year.

All permit owners must submit quarterly catch reports on their activities to the Bureau of Marine Resources, including total numbers of specimens or pieces taken, places where they have been taken, and number of fishermen involved. All this information is used by the Bureau of Marine Resources to manage the fishery. Analyzing these data will allow the Bureau to evaluate the state of the fishery and to decide whether the number of permits issued should be increased or decreased.

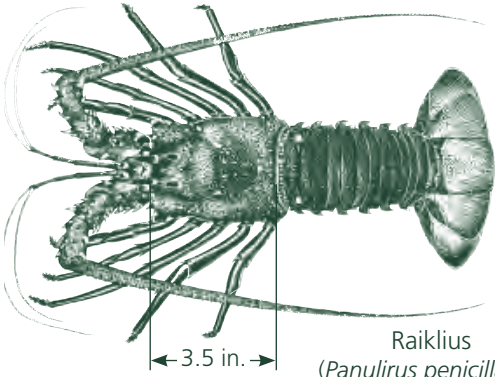


Rock lobsters

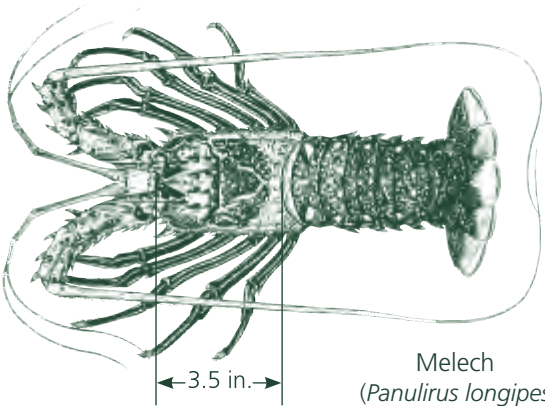
14



Bleiached
(*Panulirus versicolor*)



Raiklius
(*Panulirus penicillatus*)



Melech
(*Panulirus longipes
femoristriga*)

It is against the law to fish, sell or buy any egg-bearing female of rock lobster (cheraprukl) whatever the size and regardless of where such species may have originated.

It is against the law to fish for, sell, receive, possess, export, cause to be exported or buy the following species of rock lobsters (cheraprukl) if less than three and a half (3.5) inches in total length of the carapace (measured from the tip of the rostrum midway between the eyes to the end of the carapace), regardless of where such species may have originated:

- bleiached (*Panulirus versicolor*)
- raiklius (*Panulirus penicillatus*)
- melech (*Panulirus longipes femoristriga*)

It is against the law to export any rock lobster (cheraprukl) of any size whatsoever and regardless of where such species may have originated.

Ref. 27 PNCA 1204

Rock lobsters live in narrow reef crevices. They feed, mostly during the night, on animal and plant debris, helping to keep the reef clean.

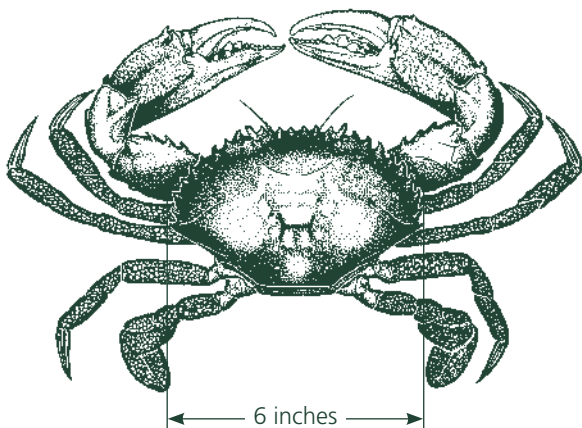
When released by the females, the rock lobsters' eggs drift in the open ocean while going through the different stages of development. Only a tiny number of the hundreds of thousands of eggs released survive and are carried back to a reef for shelter.

By setting a minimum size limit, we protect the young lobsters and give them a chance to reproduce several times before they can be captured.

Palau's population of rock lobsters is relatively small and fragile and there is a high demand on the local market for this delicacy. So, a ban on export is in place as a complementary protection measure.

Mangrove crab

16



Emang
(*Scylla serrata*)

It is against the law to fish for, sell, buy receive, possess, export or cause to be exported any egg-bearing female of mangrove crab (emang, *Scylla serrata*) of any size whatsoever and regardless of where such species may have originated.

It is against the law to fish for, sell, buy receive, possess, export or cause to be exported mangrove crab (emang) if less than six (6) inches across the shell (carapace), regardless of where such species may have originated

It is against the law to export any mangrove crab (emang) of any size whatsoever and regardless of where such species may have originated.

Ref. 27 PNCA 1204

Mangrove crabs (emang) commonly inhabit mud flats and mangrove forests, favoring soft muddy bottoms, often below tide levels, although females carrying eggs are present in deeper waters up to 30 miles offshore.

The eggs need very favorable conditions to go through the larval stages and, as for any other crustacean, only a tiny number of the millions of eggs carried by the female will become adult crabs. This is why it is essential to protect the egg-bearing females.

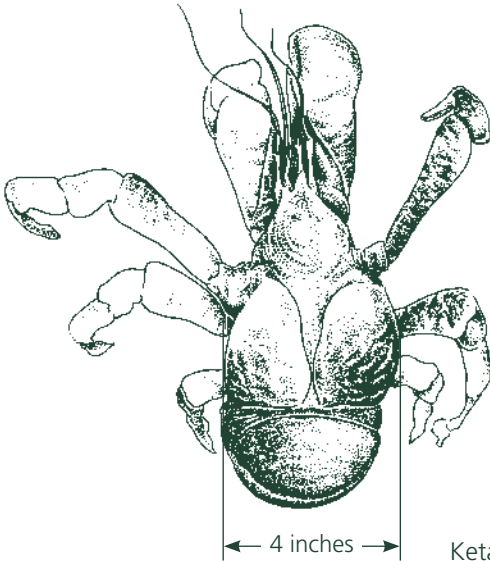
In tropical waters, mangrove crabs are mature when they are about 18 months old, which corresponds approximately to a carapace width of 5 inches. If we only catch mangrove crabs with a carapace width of more than 6 inches, we make sure that all the crabs caught have reproduced at least once.

Mangrove crabs are considered a delicacy in Palau both by local people and visiting tourists. As the resource is scarce, it has been decided to give preference to the local market and ban all export of this species.



Coconut crab

18



Ketat, yefi
(*Birgus latro*)

It is against the law to fish for, sell, buy receive, possess, export or cause to be exported any egg-bearing female of coconut crab (ketat, *Birgus latro*) of any size whatsoever and regardless of where such species may have originated.

It is against the law to fish for, sell, buy receive, possess, export or cause to be exported any coconut crab (ketat) if less than four (4) inches across the shell (carapace).

It is against the law to export any coconut crab (ketat) of any size whatsoever and regardless of where such species may have originated.

Ref. 27 PNCA 1204

Coconut crabs (ketat, yefi) are the largest of the land crabs; they can grow to a weight of 8 pounds. Adult coconut crabs live almost exclusively on land. However, like most species of crabs, the early stages of their life are aquatic.

Females carry approximately 100,000 eggs for three weeks, a time during which they need to leave their 'normal' habitat to go back towards the shore where they look for a suitable place (high humidity, access to fresh and salt water, abundance of holes and crevices, protection from sun and wind). The eggs are released into the sea where they drift for several weeks before a very small number of newly formed crabs crawl back to the shore.

Coconut crabs grow very slowly and live much longer than most other crustaceans — up to 60 years. This is why they really need to be protected.

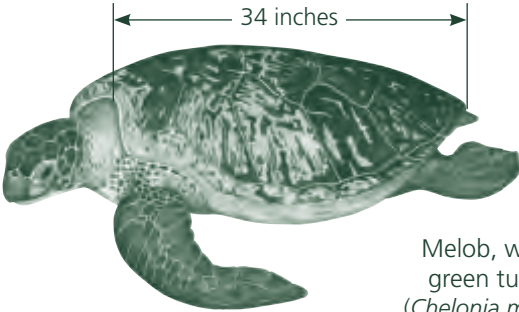
Individuals with a carapace narrower than 4 inches may be too young to have already reproduced. They must be fully protected.

The demand for coconut crab on the local market already exceeds the supply. Allowing export would put more pressure on an already fragile resource. This is why it is forbidden.

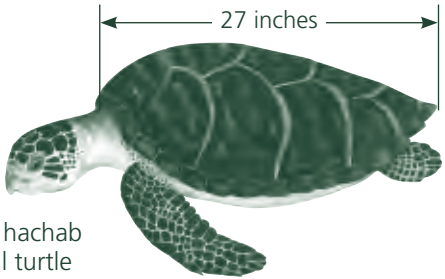


Sea turtles

20



Melob, woru
green turtle
(*Chelonia mydas*)



Ngasech, hachab
hawksbill turtle
(*Eretmochelys imbricata*)

It is against the law to:

- take any female turtle while she is on land,
- take turtle eggs at any time,
- take any turtle during the months of June, July, August, December and January,
- take, during the open season, green turtles (melob; *Chelonia mydas*) with a carapace length of less than 34 inches,
- take, during the open season, hawksbill turtles (ngasech; *Eretmochelys imbricata*) with a carapace length of less than 27 inches.

Ref. 24 PNCA 1201

The green turtle (melob, woru) has long been a favorite Palauan food and the hawksbill (ngasech, hachab) has provided important shell products to our people. Because these traditional uses of turtles and their role in our cultural heritage are very important they should be maintained.

However, fishermen and research biologists in Palau and around the world have noticed a dramatic decrease in the numbers of sea turtles (uel), which are also considered in danger of extinction worldwide. We are currently at a point in the history of Palau where we are in danger of losing the turtles that we value so much. It is therefore essential that the regulations are known to all and respected by all.

Sea turtles come back to the place where they were born to lay their eggs. So turtles born in Palau will come back to Palau even after very long journeys to far distant waters. If we keep catching the females when they are on land and taking the eggs from the nests in the sand we put the future generations of Palauan turtles in great danger of extinction.

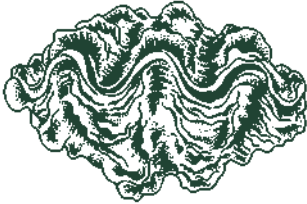
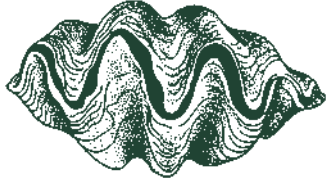
We must also respect the minimum size limits put in place to protect turtles too young to reproduce and the closed seasons set to protect all turtles during peaks of the mating and nesting seasons (June to August, and December to January).

Also, if we avoid the capture of adult females at all times, they can continue to contribute the thousands of young needed to replenish our diminishing turtle population year after year. So, if you encounter an adult female (females have a shorter tail than male adults) in the water or on the beach, please let her go in peace. She will return to Palau year after year and continue to supply us with turtles for generations to come.



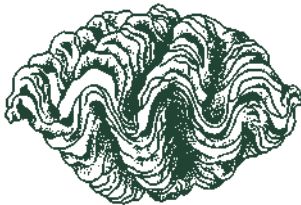
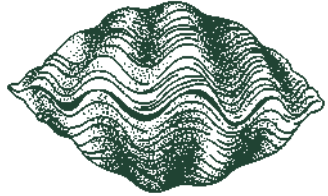
Giant clams

Otkang
(*Tridacna gigas*)



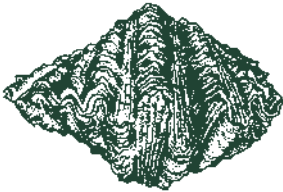
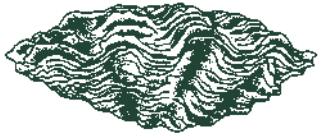
Ribkungel
(*Tridacna squamosa*)

Kism
(*Tridacna derasa*)



Melibes
(*Tridacna maxima*)

Oruer
(*Tridacna crocea*)



Duadeb
(*Hippopus hippopus*)

Duadeb
(*Hippopus porcellanus*)



It is against the law to export any of the following species of clams (kim), or part thereof, regardless of where such species may have originated, except cultured ones:

- otkang (*Tridacna gigas*),
- ribkungel (*Tridacna squamosa*),
- kism (*Tridacna derasa*),
- melibes (*Tridacna maxima*),
- oruer (*Tridacna crocea*),
- duadeb (*Hippopus hippopus*), and
- duadeb (*Hippopus porcellanus*).

Ref. 24 PNCA 1204

Giant clams are bivalves that feed by filtering seawater and cultivating microscopic algae within their tissues. To grow well they need clean seawater and plenty of sunlight.

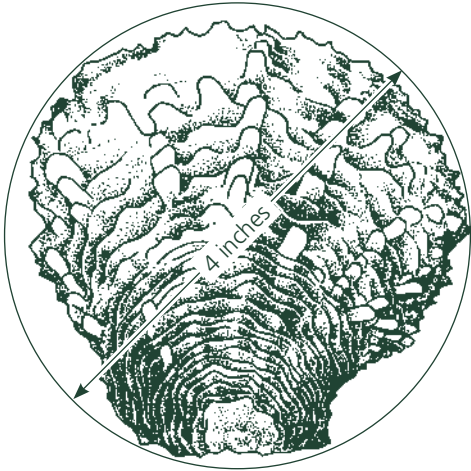
Giant clams represent a traditional food source for the people of Palau. They have also been exploited occasionally by foreign boats coming from Asia. These two factors have contributed to the decline of giant clams in Palauan waters.

To protect them, a ban on all export of wild-caught specimens has been put in place.

In addition, culture techniques have been successfully developed at the former Micronesian Mariculture and Demonstration Center (MMDC), which is now part of the BMR Aquaculture and Mariculture Branch. These techniques have been taught to local people and an export market for farmed giant clams has been established.

Blacklip pearl oyster

24



Chesiuch
(*Pinctada margaritifera*)

No blacklip pearl oyster (chesiuch, *Pinctada margaritifera*) with a shell diameter of less than four (4) inches can be harvested at any time.

No blacklip pearl oyster of any size can be harvested from August 1 to December 31 inclusive.

Ref. 27 PNCA 1221

Blacklip pearl oysters (chesiuch) can be found down to 25 fathoms, but are naturally most abundant just below low-tide level. To feed they filter the seawater. Their growth is related to the quality of the seawater in which they live.

Blacklip pearl oysters are generally mature when they reach two years of age (or a shell diameter of approximately 4 inches). Spawning can happen several times a year depending on the water temperature, but mainly occurs during the second part of the year (from August 1 to December 31 inclusive).

In ancient times, blacklip pearl oysters were fished for their shells, which were used in jewellery and for fishing lures. The occasional pearl found by fishermen was the 'cherry on the cake'.

Nowadays, blacklip pearl oysters are cultured for black pearls in several places in the Pacific with great success. To be able to start the same kind of industry in Palau, we need a natural stock in good shape to provide seed oysters.

Like any other marine organism, the presence of pearl oysters in our waters is essential. Pearl oysters of low value today could become treasures when a Palauan pearl-farming industry starts.

If we respect the minimum size and the closed season, we give pearl oysters the opportunity to reproduce in good conditions.



Trochus



Semum
(*Trochus niloticus*)

Except during open seasons that are designated from year to year by the Olbiil Era Kelulau and subject to further restrictions by each of the State Governments, the harvesting of trochus (semum, *Trochus niloticus*) is prohibited.

During open seasons, only trochus (semum) of more than three (3) inches in diameter at the base can be harvested.

Even during open seasons, certain areas can be declared closed by either the National or the State Governments.

Ref. 27 PNCA 1243

Trochus (semum) is mainly harvested for its valuable shell, which is used to make buttons for top-quality shirts by the fashion industry in Europe and Asia. It is also appreciated in Palau as a food source.

Because trochus live in shallow waters and move very slowly, they can be easily collected, and hence over-fished. This is why, in Palauan waters, this important commercial species has been protected by different regulations for more than 80 years.

Nowadays, the Olbiil Era Kelulau (OEK) can decide, from year to year, to open the fishery for a limited period of time. To make its decision, OEK uses the results of scientific surveys of the trochus resource. Even during these open seasons, OEK and the State Governments can designate certain areas as closed. For more information on the next open season, check with the nearest BMR office.

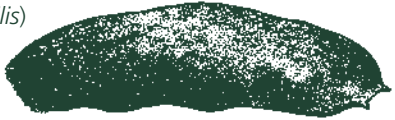
Even during open seasons, juveniles (trochus too young to reproduce) must be protected. It is estimated that it is only when they reach a size of three inches (measured across the base of the shell) that all trochus are mature (able to reproduce). They are then approximately three years old.

Because trochus shells can be stored for an extended period of time, they provide one of the few cash-income opportunities for fishing communities living in places where transport is scarce.

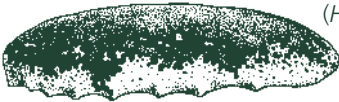
If we respect the closed seasons and leave the young trochus in peace, we will give this fragile resource a chance to last for future generations, continuing to provide a source of cash income for remote fishing communities.

Sea cucumbers

Bakelungal-chedelkelek
(*Holothuria nobilis*)



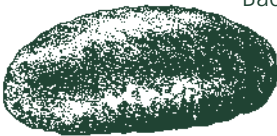
Bakelungal-cherou
(*Holothuria fuscogilva*)



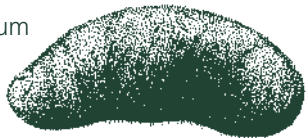
Molech
(*Holothuria scabra*)



Badelchelid
(*Actinopyga mauritiana*)



Eremrum
(*Actinopyga miliaris*)



Temetamel
(*Thelenota ananas*)



It is against the law to export any of the following species of sea cucumbers, regardless of where such species may have originated:

- bakelungal-chedelkelek (*Holothuria nobilis*),
- bakelungal-cherou (*Holothuria fuscogilva*),
- molech (*Holothuria scabra*),
- badelchelid (*Actinopyga mauritiana*),
- eremrum (*Actinopyga miliaris*), and
- temetamel (*Thelenota ananas*).

Ref. 27 PNCA 1204

In Palau, sea cucumbers are mostly found on sandy or muddy bottoms. Like all sea cucumbers, they have separate sexes and reproduction occurs when males and females release their gametes simultaneously in surrounding seawater, so many sea cucumbers have to gather in the same place for reproduction to be successful.

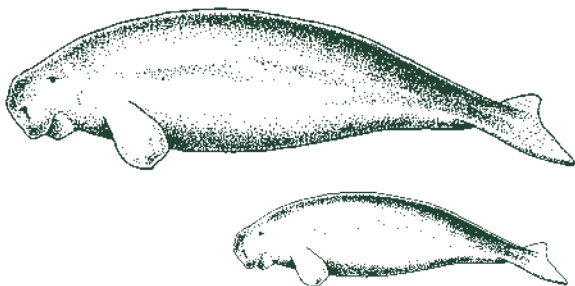
Sea cucumbers are important to the lagoon environment because they scavenge on the reef and turn over the sand on the lagoon floor, preventing the build-up of decaying organic matter and releasing nutrients that would otherwise be locked up under layers of sediment.

Sea cucumbers are a very easy target for fishermen and their overexploitation could have severe consequences for the whole reef.

As they are a traditional food source for the people of Palau, it has been decided to limit their exploitation by putting a ban on all exports.

Dugong

30



Mesekiu
(*Dugong dugon*)

It is against the law to kill, or possess dugongs
(mesekiu, *Dugong dugon*).

Ref. 27 PNCA 1204

Dugongs (mesekiu) breathe air, feed their young milk and eat only sea grass. An adult dugong can reach a length of 11 feet and weigh over 1,500 pounds. They can live to be over 70 years old.

Palau's population of dugongs is the most isolated in the world. This means that dugongs from other parts of the world cannot come and help increase Palau's shrinking population (scientists estimate that only 50 to 200 dugongs are left in Palauan waters, compared with the 2,000 that used to live here).

A female dugong does not mate until she is at least 10 years old. On average she has a baby, called a calf, only once every 5 years. This very slow reproductive rate is the reason it will take the Palau population a long time to recover from being over-hunted.

However, in a few years, if this protection measure is successful, dugongs could become a big source of income for Palauans interested in taking tourists out for an evening Rock Island cruise and the opportunity to see dugongs alive in the wild.

A live dugong could one day be worth very much more than a dead dugong . . .



Sponges, hard corals and marine rock

32



No sponges (any species of the phylum Porifera) may be exported.

No hard corals from the orders Scleractinia (stony corals), Hydrocorallina (fire corals), Coenothecalia (blue corals) and Stolonifera (organ pipe corals) may be exported.

No marine rock (any carbonate based rock) may be exported.

*Ref. 27 PNCA 1205, 1206 and Regulations
on the Collection of Marine Resources
for Aquaria and Research*

Sponges contribute in important ways to the ecology of the reef. This living animal has a thin skin with thousands of invisible tiny holes. As water passes through these holes, the sponge filters out and consumes microscopic particles that might otherwise cloud the reef. Sponges also provide the perfect home for tiny fish, crabs and flatworms.

Hard corals are formed by tiny sea animals called polyps. Coral polyps extend their tentacles into surrounding waters and feed on microscopic plants and animals. Producing hard outer limestone skeletons over years and years, some of the hard corals form the very foundation of the reef. Coral reefs are essential to Palau for many reasons:

- They protect coastlines and coastal villages from large ocean waves made by storms and cyclones.
- They create a place where crabs, lobsters, clams and reef fish can live and provide food for nearby villages and towns.
- Coral skeletons, over time, will break down to rubble and sand, which helps build up shorelines and beaches.
- Undamaged coral reefs attract tourists, thus providing a growing source of income to many local people.

Marine rock, or 'live' rock, is coral debris on which new life (soft corals, algae, anemones, etc.) settles. It often provides a home for very small forms of marine life (crabs, worms, fish, etc.).

For all these reasons, sponges, hard corals and marine rock need protection. This is why a ban on export has been put in place.





Other restrictions

35

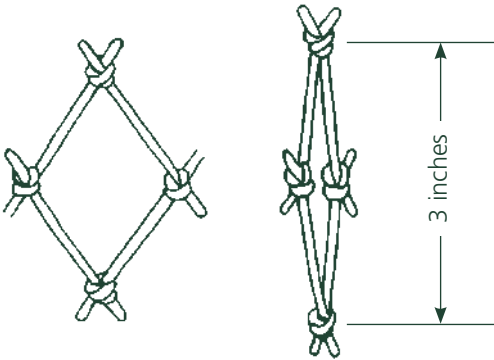


Gear restrictions

36

It is against the law to fish with, possess or abandon a gillnet, surround net or kesokes net with a mesh size of less than three (3) inches measured diagonally.

Ref. 27 PNCA 1204



If we use small-mesh nets, we will kill many young fish before they have time to reproduce. Also, because young fish are small, they have little value on the market.

It is against the law to use any explosives, poisons or chemicals to catch marine life.

Ref. 27 PNCA 1302

When using explosives, poisons or chemicals to catch fish, all the surrounding marine life — including smaller fish, reef invertebrates and, most important, the corals themselves — is destroyed. It may take many years for this marine life to recover and create the right conditions for the big fish to come back. Furthermore, dead corals and the lack of big fish will make the area unsuitable for the development of a tourist diving industry.

Except as authorized by regulation or permit issued by the Minister, it is against the law to fish while using any form of underwater breathing apparatus other than a snorkel.

Ref. 27 PNCA 1204

By putting a ban on scuba, hookah or any other underwater breathing equipment except a snorkel, we create a natural reserve area in deeper waters where marine life — especially the larger reef fish that can produce more eggs — is protected.

Exporting marine resources

Prior to any export of marine resources out of the Republic of Palau, the person exporting shall complete and sign four copies of a Marine Export Declaration.

*Ref. 27 PNCA 1206, 1207
and Regulations on the Reporting and
Labelling of Exports of Marine Resources*

For each export out of the country, the person exporting shall provide all applicable information requested on the Marine Export Declaration form, including, but not limited to, the following:

For each species:

- names (scientific, Palauan and/or English common names),
- net weight (without ice or packing), and
- country of origin.

For the export as a whole:

- destination,
- total gross weight, and
- number of containers.

Exports may be inspected by authorized personnel of the Bureau of Revenue, Customs and Taxation or of the Ministry of Resources and Development.

Any person who exports any fish or other marine resources for commercial purposes shall submit to BMR a report on the catch of those marine resources, as well as of any other marine resources taken during the course of fishing for the marine resources being exported. This report shall include all information concerning the catch (including total numbers of specimens or pieces taken, places where they were taken, number of fishermen involved, gear used, etc.).

Marine research

All persons engaging in any marine-resource-related research, including scientific, maricultural or medical research, must have a valid Marine Research Permit issued by the Minister or his designee.

*Ref. 27 PNCA 1205, 1206
and Regulations on the Collection of
Marine Resources for Aquaria and Research*

Following the same principle applied to aquarium species, in order to monitor and encourage appropriate marine-related research, a Marine Research Permit system has been put in place. Anyone wanting to engage in any marine-resource-related research, such as scientific, maricultural or medical research, must apply for a Marine Research Permit and comply with any other applicable national or state law or regulation.

All permit owners must submit quarterly catch reports on their activities to BMR, including total numbers of specimens or pieces of each species taken, places where they were taken, number of fishermen involved, etc.

Permit holders wishing to export specimens must comply with the 'Regulations on the Reporting and Labeling of Exports of Marine Resources'.







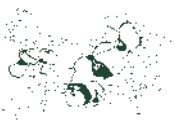




*Summary of Palau
national domestic
fishing laws*




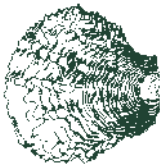

Summary of Palau national domestic fishing laws




SPECIES		MINIMUM SIZE	HARVESTING SEASON	OTHER RESTRICTIONS	CRIMINAL PENALTIES
 Groupers Tiau; katuu'tiau; mokas; ksau'temekai; meteungerel'temekai	No	Closed: April–July		1 st conviction: up to \$250 2 nd conviction: up to \$500 and 30 days in jail 3 rd conviction: \$1000 and 6 months in jail Thereafter: \$5000 and 1 year in jail	
 Rabbittfish Meyas	No	Closed: February–March		1 st conviction: up to \$250 2 nd conviction: up to \$500 and 30 days in jail 3 rd conviction: \$1000 and 6 months in jail Thereafter: \$5000 and 1 year in jail	

	<p>Humphead parrotfish Kemeduki; berdebed; fahorari hamaduhiri</p>	<p>Closed permanently</p>	<p>Closed permanently</p>	<p>No possession No export</p>	<p>1st conviction: up to \$250 2nd conviction: up to \$500 and 30 days in jail 3rd conviction: \$1000 and 6 months in jail Thereafter: \$5000 and 1 year in jail</p>
	<p>Napoleon wrasse Ngjimer; mami; fahorari mami</p>	<p>Closed permanently</p>	<p>Closed permanently</p>	<p>No possession No export</p>	<p>1st conviction: up to \$250 2nd conviction: up to \$500 and 30 days in jail 3rd conviction: \$1000 and 6 months in jail Thereafter: \$5000 and 1 year in jail</p>
	<p>Aquarium species</p>	<p>No</p>	<p>Open</p>	<p>Fishing and export restricted to people in possession of an Aquarium Permit</p>	<p>1st conviction: up to \$250 2nd conviction: up to \$500 and 30 days in jail 3rd conviction: \$1000 and 6 months in jail Thereafter: \$5000 and 1 year in jail</p>

SPECIES	MINIMUM SIZE	HARVESTING SEASON	OTHER RESTRICTIONS	CRIMINAL PENALTIES
 <p>Rock lobsters Cherapruki; raiklius; bleyached; melech; uul; uuh</p>	3.5 inches total length of carapace	Open	No export; no taking of egg-bearing females whatever the length; no possession of undersized specimens	1 st conviction: up to \$250 2 nd conviction: up to \$500 and 30 days in jail 3 rd conviction: \$1000 and 6 months in jail Thereafter: \$5000 and 1 year in jail
 <p>Mangrove crab Emang</p>	6 inches greatest distance across width of carapace	Open	No export; no taking of egg-bearing females whatever the length; no possession of undersized specimens	1 st conviction: up to \$250 2 nd conviction: up to \$500 and 30 days in jail 3 rd conviction: \$1000 and 6 months in jail Thereafter: \$5000 and 1 year in jail

	<p>Coconut crab Ketat; yefi</p>	<p>4 inches greatest distance across width of carapace</p>	<p>Open</p>	<p>No export; no taking of egg- bearing females whatever the length; no possession of un- dersized specimens</p>	<p>1st conviction: up to \$250 2nd conviction: up to \$500 and 30 days in jail 3rd conviction: \$1000 and 6 months in jail Thereafter: \$5000 and 1 year in jail</p>
	<p>Green turtle Melob; woru</p>	<p>34 inches carapace length</p>	<p>Closed June–August and December–January</p>	<p>No taking of eggs; no taking of female while she is on shore</p>	<p>Up to 6 months in jail, or Up to \$100, or Both of the above</p>
	<p>Hawksbill turtle Ngasech; hachab; hasab</p>	<p>27 inches carapace length</p>	<p>Closed June–August and December–January</p>	<p>No taking of eggs; no taking of female while she is on shore</p>	<p>Up to 6 months in jail, or Up to \$100, or Both of the above</p>

SPECIES		MINIMUM SIZE	HARVESTING SEASON	OTHER RESTRICTIONS	CRIMINAL PENALTIES
	Giant clams Otkang; ribkungel; kism; melibes; oruer; duadeb/duadue	No	Open	No export (except cultured specimens)	No less than \$300 for each violation, or Up to 2 years in jail for each violation, or Both of the above
	Blacklip pearl oyster Chesiuch	4 inches diameter across the shell	Closed August–December		Up to 6 months in jail, or Up to \$100, or Both of the above
	Trochus Semum; ekoek	3 inches basal diameter	Designated from year to year by Olbiil Era Kelulau	State Governments can designate closed areas during open seasons	\$100 for each undersized trochus taken or pur- chased

	<p>Sea cucumbers Bakelungal-chedelkelek; bakelungal-cherou; temetamel; badelchelid; melech; eremrum; periperi</p>	<p>No</p>	<p>Open</p>	<p>No export</p>	<p>1st conviction: up to \$250 2nd conviction: up to \$500 and 30 days in jail 3rd conviction: \$1000 and 6 months in jail Thereafter: \$5000 and 1 year in jail</p>
	<p>Dugong Mesekiu</p>		<p>Closed permanently</p>		<p>1st conviction: No less than \$5000, or 3 months – 1 year in jail 2nd conviction: No less than \$10,000, or 6 months – 3 years in jail</p>
	<p>Sponges, hard corals and marine rock Rurout; merand; bad l'chei</p>	<p>No</p>	<p>Open</p>	<p>No export</p>	<p>Up to 6 months in jail, or Up to \$100, or Both of the above</p>

OTHER PROHIBITED ACTIONS	CRIMINAL PENALTIES
Fishing while using any form of underwater breathing apparatus other than a snorkel.	\$500 fine, or Up to 1 year in jail, or Both of the above for each violation
Making any entry or statement in writing completed or submitted in connection with the export of fish which is false or misleading.	Fine of not less than \$400, or 6 months to 2 years in jail, or Both of the above for each violation
<ol style="list-style-type: none"> 1. Fishing with gill or surround net with a mesh size of less than 3 inches measured diagonally. 2. Retaining, possessing or abandoning kesokes net with a mesh size of less than 3 inches measured diagonally. 	<ol style="list-style-type: none"> 1st conviction: up to \$250 2nd conviction: up to \$500 and 30 days in jail 3rd conviction: \$1000 and 6 months in jail Thereafter: \$5000 and 1 year in jail
<ol style="list-style-type: none"> 1. Fishing with poison or explosives 2. Putting poison or explosives in the water for any reason, even by mistake 	Felony: \$100–2000 fine and 6 months to 2 years in jail \$100 fine and Up to 6 months in jail



Palau

Produced by



the Information Section
of the Marine Resources Division
of the Secretariat of the Pacific Community (SPC)

in collaboration with



the Bureau of Marine Resources (BMR)
of the Republic of Palau

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Flora and Fauna of the Rock Islands-Southern Lagoon Management Area: Species Lists

Note: This table is in the process of being updated (2011)

Prepared by Michelle Moses, Koror State Department of Conservation and Law Enforcement, 2004

REFERENCES USED FOR THE FLORA AND FAUNA LIST:

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**Terrestrial Flora of Koror State's
Rock Islands-Southern Lagoon Area**

Palauan name	Common name	Scientific name	Status (Endemic, Native Introduced, etc.)
		POLYPODIACEAE	
		<i>Antrphyum plantagineum</i>	
<i>Liker bedaoch</i>		<i>Asplenium laserpitifolium</i>	
<i>Bukel beluu; Occhema remark</i>	<i>Birds nest fern</i>	<i>Asplenium nidus</i>	
		<i>Asplenium polyodon</i>	
		<i>Belvisia spicata</i>	
		<i>Cyclopeltis kingii</i>	
		<i>Davallia solida</i>	
		<i>Humata banksii</i>	
<i>Teroter</i>		<i>Nephrolepis saligna</i>	
		<i>Polypodium punctatum</i>	
<i>Ebechab</i>		<i>Polypodium scolopendria</i>	
		<i>Pyrrosia laceolata</i>	
		<i>Tectaria crenata</i>	
		<i>Tectaria grandifolia</i>	
		<i>Thelypteris cf gretheri rupi-insularis</i>	
<i>Albeluu</i>		<i>Vittaria incurvata</i>	
		PSILOTACEAE	
		<i>Psilotum nudum</i>	
		SCHIZAEACEAE	
		<i>Actinostachys spirophylla</i>	
		CYCADACEAE	
<i>Kokeal; Remiang</i>		<i>Cycas circinalis</i>	
		CYPERACEAE	
<i>Kerngimesked</i>		<i>Fimbristylis cymosa</i>	
		DIOSCOREACEAE	
		<i>Dioscorea sp.</i>	
		FLAGELLARFACEAE	
<i>Bangerenguis</i>		<i>Flagellaria indica</i>	
		GRAMINEAE	
		<i>Lepturus repens</i>	
		HYDROCHARITACEAE	
		<i>Halophila minor</i>	
		LILIACEAE	
<i>Orredakl</i>		<i>Dracaena multiflora</i>	
		ORCHIDACEAE	

		<i>Liparis sp.</i>	
		<i>Taeniophyllym sp.</i>	
		<i>Taeniophyllum sp.</i>	
		<i>Taeniophyllum sp.</i>	
		PALMAE	
<i>Lius</i>	<i>Coconut tree</i>	<i>Cocos nucifera</i>	
<i>Ebouch</i>		<i>Gulubia palauensis</i>	
		PANDANACEAE	
<i>Beku, Ongor</i>		<i>Pandanus cf dubius</i>	
<i>Ongor</i>		<i>Pandanus cf tectorius</i>	
		<i>Halodule uninervis</i>	
		<i>Syngodium sp.</i>	
		POTAMOGETONACEAE	
		<i>Halodule uninervis</i>	
		<i>Syngodium sp.</i>	
		ACANTHACEAE	
		<i>Hemigraphis reptans</i>	
		APOCYNACEAE	
		<i>Alyxia palauensis</i>	
<i>Uaoch</i>		<i>Neisosperma oppositifolia</i>	
		<u>ARALIACEAE</u>	
		<i>Meryta senfftiana</i>	
<i>Kesiamel</i>		<i>Osmoxylon oliveri</i>	
<i>Bungaruau</i>		<i>Poliscias grandifolia</i>	
	<i>Five fingers</i>	<i>Schefflera odorata</i>	
		ASCLEPIADACEAE	
		<i>Dischidia hahliana</i>	
<i>Uralanguis</i>		<i>Sarcolobus sulphureus</i>	
		BORAGINACEAE	
		<i>Cordia subcordata</i>	
		<i>Tournefortia argentea</i>	
		BURSERACEAE	
<i>Mesecheues?</i>		<i>Canarium sp. (hirsutum?)</i>	
		CAPPARIDACEAE	
		<i>Capparis carolinensis</i>	
		<i>Capparis cordifolia</i>	
		<i>Capparis quinifolia</i>	
		CASUARINACEAE	
<i>Ngas</i>	<i>Ironwood</i>	<i>Casuarina equisetifolia</i>	
		CELASTRACEAE	
		<i>Maytenus palauaica</i>	

		COMBRETACEAE	
<i>Miich</i>	Pacific almond nut	<i>Terminalia catappa</i>	
<i>Esemiich</i>		<i>Terminalia samoensis</i>	
		EUPHORBIACEAE	
		<i>Drypetes nitida</i>	
		<i>Glochidion</i> sp.	
		<i>Glochidion</i> sp.	
<i>Bedel</i>		<i>Macaranga carolinensis</i> var. <i>carolinensis</i>	
		<i>Phyllanthus rupi-insularis</i>	
		GOODENIACEAE	
		<i>Scaevola sericea</i>	
		GUTTIFERAE	
<i>Btaches</i>		<i>Calophyllum inophyllum</i>	
		<i>Garcinia rumiyo</i> var. <i>calcicola</i>	
		HERNANDIACEAE	
<i>Dokou</i>		<i>Hernandia sonora</i>	
		HIPPOCRATACEAE	
<i>Kerangel</i>		<i>Loesneriella macrantha</i> var. <i>palauaica</i>	
		LECYTHIDACEAE	
		<i>Barringtonia asiatica</i>	
		LOGANIACEAE	
		<i>Geniostoma sessile</i>	
<i>Kalm; Aralm</i>		<i>Neubergia celebica</i>	
		<i>Pemphis acidula</i>	
		LEGUMINOCEAE	
<i>Dort</i>	Ifil	<i>Instia bijuga</i>	
		FABACEAE	
		<i>Desmodium umbellatum</i>	
<i>Kisakes</i>		<i>Pongamia pinnata</i>	
		MIMOSACEAE	
<i>Ukall</i>		<i>Serianthes kanehirae</i>	
		MALVACEAE	
<i>Chermal</i>		<i>Hubiscus tiliaceus</i>	
		MELIACEAE	
		<i>Aglaia palauensis</i>	
<i>Meduulokebong</i>		<i>Xylocarpus granatum</i>	

		MORACEAE	
<i>Meduu</i>		Artocarpus atilis	
		<i>Artocarpus mariannensis</i>	
		<i>Ficus microcarpa</i> var. <i>microcarpa</i>	
		<i>Ficus prolixa</i> var. <i>carolinensis</i>	
		<i>Ficus sagittata</i>	
		<i>Ficus senffiana</i>	
<i>Oseked</i>		<i>Ficus tinctoria</i> var. <i>neo-</i> <i>ebudarum</i>	
		MYRISTICACEAE	
<i>Chemeklachel</i>		<i>Horsfeldia amklaal</i>	
<i>Chersachel</i>		<i>Horsfeldia novo-guieensis</i>	
<i>Chersachel</i>		<i>Horsfeldia palauensis</i>	
		<i>Myristica insularis</i>	
		MYRSINACEAE	
		<i>Discocalyx mezii</i> ?	
		<i>Discocalyx palauensis</i>	
		<i>Maesa palauensis</i>	
		MYRTACEAE	
<i>Kertaku</i>		<i>Decaspermum fruticosum</i>	
		<i>Decaspermum raymundii</i>	
		<i>Eugenia malaccensis</i>	
		<i>Eugenia cuminii</i>	
		<i>Eugenia palauensis</i>	
<i>Kesiil</i>		<i>Eugenia reinwardtiana</i>	
<i>Rebotel</i>		<i>Eugenia suzukii</i>	
<i>Kidel?</i>		<i>Eugenia javanica</i>	
		NEPENTHACEAE	
<i>Meliik</i>		<i>Nepenthes mirabilis</i>	
		NYCTAGINACEAE	
		<i>Pisonia grandis</i>	
		PIPERACEAE	
		<i>Peperomia kraemeri</i>	
<i>Rtertiil</i>		<i>Peperomia palauensis</i> var. <i>palauensis</i>	
		RHIZOPHORACEAE	
		<i>Rhizophora mucronata</i> var. <i>styolosa</i>	
		RUBIACEAE	
		<i>Aidia racemosa</i>	
<i>Ralm</i>		<i>Badusa palauensis</i>	

<i>Belau</i>		<i>Guettarda speciosa</i>	
		<i>Hedyotis</i> sp.	
		<i>Hedyotis stingulosa</i>	
<i>Ngel</i>		<i>Morinda citrifolia</i> ?	
<i>Tielar bekai; Odoid, Meldii</i>		<i>Ophiorrhiza palauensis</i>	
		<i>Psychotria</i> sp.	
		<i>Psychotria</i> sp.	
		SAPINDACEAE	
<i>Ebeludes?</i>		<i>Allophylus ternatus</i>	
		<i>Allophylus timoriensis</i>	
		STERCULIACEAE	
		<i>Sterculia palauensis</i>	
		SYMPLOCACEAE	
<i>Ebtui</i>		<i>Symplocos racemosa</i> var. <i>palauensis</i>	
		THYMELEACEAE	
<i>Tebudel; Rau</i>		<i>Wikstroemia elliptica</i>	
		TILIACEAE	
<i>Elsau</i>		<i>Trichospermum ledermannii</i>	
		URTICACEAE	
		<i>Elatostema calcareum</i>	
		<i>Pipturus argenteus</i>	
		VERBENACEAE	
<i>Dub; Rtachel</i>		<i>Callicarpa candicans</i> var. <i>intergrifolia</i>	
<i>Eruei; Keruia</i>		<i>Callicarpa elegans</i>	
		<i>Gmelina elliptica</i>	
		<i>Premna obtusifolia</i> (<i>serratifolia</i> ?)	

Fauna of Koror State's
Rock Islands-Southern Lagoon Area

Palauan Name	Common Name	Scientific Name
		Class Amphibia (2 spp.)
		<i>Bufonidae</i>
Dechedch	Toad	Bufo marinus
		<i>Ranidae</i>
Dechedch	Frog	Platymantis pelewensis
		Class Aves(30sp.)
Ochaieu	Adubon's Shearwater	Puffinus iherminieri
Bedoach	Black Noddy	Phaethon lepturus
Kerkirs	Black-naped Tern	Sterna sumatrana
	Bridled Tern	Sterna anathetus
Mechadelbedaob	Brown Noddy	Anous stolidus
	Cicadabird	Coracina tenurostris
Tengadidik	Collared Kingfisher	Tengadidik
Sechosech	Common Fairy-Tern	Sechosech
Bengobaingukl	Common Sandpiper	Bengobaingukl
	Dusky White-eye	Zosterops finschii
Iakkotsiang	Greater Sulphur-Crested Cockatoo	Cacatua galerita
Chesisekiaid	Island Swiftlet	Aerodramus vanikorensis
Derariik	Lesser Golden-Plover	Pluvialis dominica
Chermelachull	Mangrove Flycatcher	Myagra erythroptus
Chesisbangiau	Micronesian Honeyeater	Myzomela rubrata
Cherosech	Micronesian Kingfisher	Halcyon cinnamomina
Bekai	Micronesian Megapode	Megapodius laperouse
Belochel	Micronesian Pigeon	Ducula oceanica
Kiuid	Micronesian Starling	Aplonis opaca
Tutau	Morningbird	Colluricincla tenebrosa
Laib	Nicobar Pigeon	Caloenas nicobarica
Chesucherubuokel	Osprey	Pandion haliaetus
Sechou	Pacific Reef-Heron	Egretta sacra
Melimdelelteb	Palau Fantail	Rhipidura lepida
Biib	Palau Fruit Dove	Ptilinopus pelewensis
Omekrengukl	Palau Ground-Dove	Gallinolumba canifrons
Chesuch	Palau Owl	Pyrrhologlaux podargina
Sechou or Melebaob	Rufus Night-Heron	Nycticorax caledonicus
	Siberian Tattler	Heteroscelus brevipes
	Wandering Tattler	Heteroscelus incanus
Dudek	White-tailed tropicbird	Phaethon lepturus
		Class Mammalia

Olik	Micronesian Fruit Bat	Pteropus mariannus pelewensis
	Palau Fruit Bat	Pteropus pilosis
Chesisualik	Pacific Sheath-tailed Bat	Emballonura semicaudata
	Musk Shrew	Suncus marinus
Beab	House Mouse	Mus musculus
	Polynesian Rat	Rattus exulans
	Roof Rat	Rattus rattus
Mesekiu	Dugong	Dugong dugon
		Class Reptilia(37 spp.)
Berebur, Sechesech	Gekkos	Gekkonidae
	Web-toed gecko	Gehyra brevipalmata
	Stump-toed gecko	Gehyra mutilata
	Oceanic Big tree gecko	Gehyra oceanica
	Gecko	Gekko sp.
	Common house gecko	Hemidactylus frenatus
	Indo-pacific tree gecko	Hemiphylladactylus cf. H. typus
	Scaly-toed gecko	Lepidodactylus lugubris
	Mourning gecko	Lepidodactylus moestus
	Micronesian Scaly-toed gecko	Lepidodactylus paurolepis
	Palau Scaly-toed gecko	Nactus sp.
	Yellowbellied sea snake	Pelmais platurus
		<i>Polychrotidae</i>
		Anolis carolinensis
	<i>Skinks</i>	<i>Scincidae</i>
	Collard lizard	Cryptoblepharus sp.
	Brown four-fingered skink	Carlia cf. C. fusca
	Littoral skink	Emoia atrocostata
	Marianas blue-tailed skink	Emoia caeruleocauda
	Blue-tailed copper skink	Emoia impar
	Kopstein's skink	Emoia jakati
	Litter skink	Eugongylus sp.
Chemaidechedui	Green Tree Skink	Lamprolepis smaragdina
	Pandanus skink	Lipinia leptosoma
	Moth skink	Lipinia cf. L. noctua
	Many-striped skink	Mabuya sp.
	Common Skink	Sphenomorphus sp. Nov.
	Palauan Skink	Sphenomorphus scutatus
		<i>Veranidae</i>
	Gray Monitor	Varanus cf. v. indicus(Ngeriungs Is., Oreor)
	<i>Snakes</i>	<i>Boidae</i>
Bersoech	Pacific Island Boa	Candoia CF. C. carinata
		<i>Colubridae</i>
	Dog-faced water snake	Cerberus rynchops
Nguis	Palau Tree Snake	Dendrelaphis lineolatus
		<i>Laticaudidae</i>
Mengernger	Banded Sea Snake	Laticauda colubrina
		<i>Typhlopidae</i>
	Palau Blind snake	Ramphotyphlops acuticaudus
	Brahminy blind snake	Ramphotyphlops braminus
	<i>Turtles</i>	<i>Chelidae</i>
		<i>Cheloniidae</i>

Melob	Green Sea Turtle	Chelonia mydas
Ngas	Hawksbill Sea Turtle	Eretmochelys imbricata
	Leatherback turtle	Dermochelys coriacea
	Olive ridley	Lepidochelys olivacea
	<i>Crocodyles</i>	<i>Crocodylidae</i>
	Saltwater crocodile	Crocodylus porosus

PALAUAN	COMMON	SCIENTIFIC
	Surgeonfishes; Moorish idol; Rabbitfishes	<i>Acanthuroidei</i>
	Surgeonfishes; Unicornfishes	<i>Acanthuridae</i>
	Achilles tang	<i>Acanthus Achilles</i>
	Bariene surgeonfish	<i>Acanthus bariene</i>
Mesekuulbad		<i>Acanthus gahhm</i>
Isaseb	Whitespotted surgeonfish	<i>Acanthus gutatus</i>
	Palelipped surgeonfish	<i>Acanthus leucocheilus</i>
Belai	Buebanded surgeonfish	<i>Acanthus lineatus</i>
	White-freckled surgeonfish	<i>Acanthus maculiceps</i>
Chesengl	Elongate surgeonfish	<i>Acanthus mata</i>
Urur	Whiteneck surgeonfish	<i>Acanthus nigricans</i>
Masch	Brown surgeonfish	<i>Acanthus nigrofuscus</i>
Masch	Bluelined surgeonfish	<i>Acanthus nigroris</i>
Kelelaumai or Merebas	Orangeband surgeonfish	<i>Acanthus olivaceus</i>
Uais	Chocolate surgeonfish	<i>Acanthus pyroferus</i>
	Thompson's surgeonfish	<i>Acanthus thomsoni</i>
Chelas	Convict tang surgeonfish	<i>Acanthus triostegus triostegus</i>
Mesekuuk	Yellowfin surgeonfish	<i>Acanthus xanthopterus</i>
Masch	Twospot bristletooth	<i>Ctenochaetus binotatus</i>
	Chevron tang (juv.); Black surgeonfish (adult)	<i>Ctenochaetus hawaiiensis</i>
Masch	Striped bristletooth	<i>Ctenochaetus striatus</i>
	Brown tang	<i>Zebrasoma scopes</i>
	Sailfin tang	<i>Zebrasoia veliferum</i>
Mengai	Whitemargin surgeonfish	<i>Naso annulatus</i>
Chongchutl	Humpback unicornfish	<i>Naso brachycentron</i>
Sechou or Demrechl	Spotted unicornfish	<i>Naso brevirostris</i>
Demelengis or Borch	Blacktongue unicornfish; Sleek unicornfish	<i>Naso hexacanthus</i>
Cherangel	Orangespine unicornfish	<i>Naso lituratus</i>
	Lopez' unicornfish	<i>Naso lopezi</i>
Chongchutel	Humpnose unicornfish	<i>Naso tuberosus</i>
Chum	Bluespine unicornfish	<i>Naso unicornis</i>
Daraboksos, Melangesakl	Bignose unicornfish	<i>Naso vlamingii</i>
Mases	Palette surgeonfish	<i>Paracanthurus hepatus</i>
Masch	Two-tone tang	<i>Zebrasoma scopes</i>
Bisch	Sailfin tang	<i>Zebrasoma veliferum</i>
	Moorish Idol	<i>Zanclidae</i>
	Moorish Idol	<i>Zanclus cornutus</i>
	Rabbitfishes	<i>Siganidae</i>
Beduut	Forktail rabbitfish	<i>Siganus argenteus</i>
Meyas	Seagrass rabbitfish	<i>Siganus canaliculatus</i>
Reked	Coral rabbitfish	<i>Siganus corallinus</i>
Reked	Pencil-streaked rabbitfish	<i>Siganus doliatus</i>
	Fuscescens rabbitfish	<i>Siganus fuscescens</i>
	Golden rabbitfish	<i>Siganus guttatus</i>
Kelsebuul	Golden-lined spinefoot	<i>Siganus lineatus</i>
	White-spotted rabbitfish	<i>Siganus oramin</i>
Reked	Masked rabbitfish	<i>Siganus puellus</i>
Bebail	Gold-spotted rabbitfish	<i>Siganus punctatus</i>

	Peppered rabbitfish	<i>Siganus punctatissimus</i>
Chepsall	Scribbled rabbitfish	<i>Siganus spinus</i>
Reked	Foxface rabbitfish	<i>Siganus vulpinus</i>
Klsebuulimerang		<i>Siganus sp.</i>
Bersoech ra daob	Eels	<i>Anguilliformes</i>
	Moray Eels	<i>Muraenidae</i>
	Allardice's moray	<i>Anarchias allardicei</i>
	Canton Island moray	<i>Anarchias cantonensis</i>
	Long-jawed moray	<i>Channomuraena vittata</i>
	Whiteface moray	<i>Echidna leucotaenia</i>
	Snowflake moray	<i>Echidna nebulosa</i>
	Barred moray	<i>Echidna polyzona</i>
	Unicolor moray	<i>Echidna unicolor</i>
	Bayer's moray	<i>Echelycore bayeri</i>
	Viper moray	<i>Enchelynassa canina</i>
	Zebra moray	<i>Gynomuraena zebra</i>
	Buro moray	<i>Gymnothorax buroensis</i>
	Enigmatic moray	<i>Gymnothorax enigmaticus</i>
	Fimbriated moray	<i>Gymnothorax fimbriatus</i>
	Yellow-margined moray	<i>Gymnothorax flavimarginatus</i>
	Brown spotted moray	<i>Gymnothorax fuscomaculatus</i>
	Graceful-tailed moray	<i>Gymnothorax gracilicaudus</i>
Cholechulach	Giant moray	<i>Gymnothorax javanicus</i>
	Blotch-necked moray	<i>Gymnothorax margaritophorus</i>
	Marshall Islands moray	<i>Gymnothorax marshallensis</i>
	Dirty yellow moray	<i>Gymnothorax melatremus</i>
Kesebekuu	Whitemouth moray	<i>Gymnothorax meleagris</i>
	One-spot moray	<i>Gymnothorax monostigmus</i>
	Yellowmouth moray	<i>Gymnothorax nudivomer</i>
	Pinda moray	<i>Gymnothorax pindae</i>
	Richardson's moray	<i>Gymnothorax richardsoni</i>
	Yellow-headed moray	<i>Gymnothorax rueppelliae</i>
Sekelekoll	Undulated moray	<i>Gymnothorax undulates</i>
	Zonipectis moray	<i>Gymnothorax zonipectis</i>
	Peppered moray	<i>Siderea picta</i>
	White-eyed moray	<i>Siderea prosopeion</i>
	Giant estuarine moray	<i>Strophidon sathete</i>
Luleu	Unicolor snake moray	<i>Uropterygius concolor</i>
	Brown spotted snake moray	<i>Uropterygius fuscoguttatus</i>
	Gosline's snake moray	<i>Uropterygius goslinei</i>
	Moon moray	<i>Uropterygius kamar</i>
	Large-headed snake moray	<i>Uropterygius macrocephalus</i>
	Marbled snake moray	<i>Uropterygius marmoratus</i>
	Large spotted snake moray	<i>Uropterygius polypilus</i>
	Many-toothed snake moray	<i>Uropterygius supraforatus</i>
	Freckle face reef eel	<i>Uropterygius xanthopterus</i>
	False morays	<i>Chlopsidae</i>
	Black-nostril false moray	<i>Kaupichthys atronasus</i>
	Shortfin false moray	<i>Kaupichthys brachychirus</i>
	Common false moray	<i>Kaupichthys hyoproroides</i>
	Conger Eels & Garden Eels	<i>Congridae</i>
	Moustache conger	<i>Conger cinereus cinereus</i>
	Spotted garden eel	<i>Heterocogner hassi</i>

	Spaghettie eels	<i>Moringuidae</i>
	Rusty spaghetti eel	<i>Moringua ferruginea</i>
	Java spaghetti eel	<i>Moringua javanica</i>
	Spaghetti eel	<i>Moringua microchir</i>
Mar	Snake Eels	<i>Ophichthidae</i>
Mar	Saddled snake eel	<i>Leiuranus semicinctus</i>
		<i>Muraenichthys gymnotus</i>
		<i>Muraenichthys laticaudata</i>
		<i>Muraenichthys macropterus</i>
		<i>Myorphis uropterus</i>
	Grooved-jaw warm eel	<i>Schismorhynchus labialis</i>
	Johnston snake eel	<i>Schultzidia johnstonensis</i>
		<i>Schultzidia retropinnis</i>
	Dark banded snake eel	<i>Callechelys catostomus</i>
	Convict snake eel	<i>Elapsopsis versicolor</i>
	False saddled snake eel	<i>Evipes percinctus</i>
	Vulture sand eel	<i>Ichthyapus vultures</i>
	Saddled snake eel	<i>Leiuranus semicinctus</i>
	Banded snake eel	<i>Myrichthys colubrinus</i>
	Spotted snake eel	<i>Myrichthys maculosus</i>
	Short-maned sand eel	<i>Phaenomonas cooperae</i>
	Silversides	<i>Atheriniformes</i>
Teber	Silversides	<i>Atherinidae</i>
	Tropical silverside	<i>Atherinomorus duodecimalis</i>
Chedings, Teber	Hardyhead silverside	<i>Atherinomorus lacunosus</i>
	Ovalaua silverside	<i>Hypoatherina ovalaua</i>
	Panatella silverside	<i>Stenatherian panatela</i>
	Frogfishes	<i>Batrachoidiformes</i>
	Frogfishes	<i>Antennariidae</i>
	Freckled frogfish	<i>Antennarius coccineus</i>
	Bandtail frogfish	<i>Antennarius dorehensis</i>
	Spiny-fufted frogfish	<i>Antennarius rosaceus</i>
	Soldierfishes; Squirrelfishes	<i>Beryciformes</i>
	Soldierfishes & Squirrelfishes	<i>Holocentridae</i>
	Cardinal soldierfish	<i>Plectypops lima</i>
	Bronze soldierfish	<i>Myripristis adusta</i>
	Brick soldierfish	<i>Myripristis amaena</i>
	Bigscale soldierfish	<i>Myripristis berndti</i>
	Doubletooth soldierfish	<i>Myripristis hexagona</i>
	Pearly soldierfish; Shoulderbar soldierfish	<i>Myripristis kuntee</i> (<i>M. multiradiatus</i>)
	Red soldierfish	<i>Myripristis murdjan</i>
	Violet soldierfish, Orangefin soldierfish	<i>Myripristis violacea</i>
	White-tipped soldierfish	<i>Myripristis vittata</i>
	White-spot soldierfish	<i>Myripristis woodsi</i>
Kedaol		<i>Adioryx spp.</i>
Techelabilis or Chomouchedekl		<i>Adioryx diadema</i>
Desachel	Sabre squirrelfish	<i>Adioryx spinifer</i>
Techelabilis		<i>Adioryx tiere</i>
Kedaol		<i>Flammeo spp.</i>
	Clearfin squirrelfish	<i>Neoniphon argenteus</i>

	Blackfin squirrelfish	<i>Neoniphon opercularis</i>
	Bloodspot squirrelfish	<i>Neoniphon sammara</i>
	Tailspot squirrelfish	<i>Sargocentron caudimaculatum</i>
	Crown squirrelfish	<i>Sargocentron diadema</i>
	Blackspot squirrelfish	<i>Sargocentron melanospilos</i>
	Finelined squirrelfish	<i>Sargocentron microstoma</i>
	Dark-striped squirrelfish	<i>Sargocentron praslin</i>
	Speckled squirrelfish	<i>Sargocentron punctatissimum</i>
	Long-jawed squirrelfish	<i>Sargocentron spiniferum</i>
	Blue-lined squirrelfish	<i>Sargocentron tiere</i>
	Pink squirrelfish	<i>Sargocentron tieroides</i>
	Violet squirrelfish	<i>Sargocentron violaceum</i>
	Dolphins, Whales	Cetacea
Demul	Dolphins	<i>Coryphaenidae</i>
Chersuuch	Common Dolphin Fish	<i>Coryphaena hippurus</i>
	Anchovies; sprats; herrings; sardines	Clupeiformes
	Anchovies	<i>Engraulididae</i>
Merau		
	Little priest	<i>Thryssa baelama</i>
	Oceanic anchovy	<i>Encrasicholina punctifer</i>
	Blue anchovy	<i>Encrasicholina heterolobus</i>
	Gold anchovy	<i>Encrasicholina devisi</i>
	Gold estuarine anchovy	<i>Stolephorus insularis</i>
	Indian anchovy	<i>Stolephorus indicus</i>
	Sprats, Herrings, & Sardines	Clupeidae
	Hasselt's sprat	<i>Dussumiera elopsoides</i>
	Sharp-nosed sprat	<i>Dussumiera sp.</i>
Kuaol, Merau	Blue sprat	<i>Spratelloides delicatulus</i>
	Silver sprat	<i>Spratelloides gracilis</i>
	Spotted pilchard	<i>Amblygaster sirm</i>
Mekebud	Gold spot herring	<i>Herklotsichthyes quadrimaculatus</i>
Teber	Hardyhead	<i>Allanetta woodwardi</i>
DesomeI	Graceful lizardfish	<i>Saurida gracilis</i>
	Nebulous lizardfish	<i>Saurida nebulosa</i>
	Twospot lizardfish	<i>Synodus binotatus</i>
	Variegated lizardfish	<i>Synodus variegates</i>
	Blackblotch lizardfish	<i>Synodus jaculum</i>
	Sand lizardfish	<i>Synodus dermatogenys</i>
	Needlefishes; Halfbeaks	Cyprinodontiformes
Sekos	Needlefishes	<i>Belonidae</i>
	Keeled needlefish	<i>Platybelone argalus platyura</i>
Teber		<i>Pranesus pinguis</i>
	Crocodile needlefish; Houndfish	<i>Tylosurus crocodiles crocodilis</i>
Sekos	Keel-jawed needlefish	<i>Tylosurus acus melanotus</i>
	Reef needlefish	<i>Strongylura incisa</i>
	Halfbeaks	Hemirhamphidae
	Spotted halfbeak	<i>Hemirhamphus far</i>
	Insular halfbeak	<i>Hyporhamphus affinis</i>
	Dussumier's halfbeak	<i>Hyporhamphus dussumieri</i>
	Estuarine halfbeak	<i>Zenarchopterus dispar</i>
	Snake Mackerels	Gempylidae
Telouchedui	Roudi escolar	<i>Promethichthys prom</i>

	Tarpons & Bonefishes	Elopiformes
	Tarpons	<i>Megalopidae</i>
Chaoldiong	Indo-Pacific tarpon	<i>Megalops cyprinoides</i>
	Bonefishes	Albulidae
	Indo-Pacific Bonefish	<i>Albula glossodonta</i>
Suld	Bonefish	<i>Albula vulpes</i>
	Clingfishes	Gobiesociformes
		<i>Gobiesocidae</i>
	Crinoid clingfish	<i>Lepadichthys caritus</i>
	Minor clingfish	<i>Lepadichthys minor</i>
	Milkfishes	Gonorhynchiformes
Aol	Milkfish	<i>Chanidae</i>
Aol	Milkfish	<i>Chanos chanos</i>
Chedeng	Sharks	Lamniformes
	Whale Shark	<i>Rhincodon typus</i>
	Nurse Shark	<i>Nebrius concolor</i>
Biall	Zebra shark	<i>Stegostoma varium</i>
Metmut		<i>Ginglymostoma ferrugineum</i>
	Leopard Shark	<i>Hemigaleidae</i>
Ulupsuchel	Reef whitetip shark	<i>Triaenodon obesus</i>
	Requiem sharks	Carcharhinidae
Besachel	Silvertip shark	<i>Carcharhinus albimarginatus</i>
Mederart, Teongt	Grey reef shark	<i>Carcharhinus amblyrhynchos</i>
	Silky shark	<i>Carcharhinus falciformis</i>
	Galapagos shark	<i>Carcharhinus galapagensis</i>
	Oceanic whitetip shark	<i>Carcharhinus longimanus</i>
Metukeoll	Reef blacktip shark	<i>Carcharhinus melanopterus</i>
Mochelas	Tiger shark	<i>Galeocerdo cuvier</i>
Metal	Lemon shark	<i>Negaprion acutidens</i>
Ulachelchedeng	Hammerhead Sharks	Sphyrnidae
Ulach	Scalloped hammerhead shark	<i>Sphyrna lewini</i>
	Great hammerhead shark	<i>Sphyrna mokorran</i>
	Thresher Sharks	Alopiidae
	Smalltooth thresher shark	<i>Alopias pelagicus</i>
Rull	Rays	Myliobatidiformes
	Sting rays	Dasyatidae
Dudek		? <i>Dasyatid bennetti</i>
Ilachetoil?	Blue spotted stingray	<i>Dasyatis kuhlii</i>
Kim	Leopard ray	<i>Himantura uarnak (Dasyatus gerrardi)</i>
Kultalchelbaeb	Black-spotted stingray, Giant reef ray	? <i>Taeniura melanospilos</i>
Ngilch	Feathertail stingray (palau)	<i>Pastinachus sephen</i>
Tubolkmerand	Thornback sting ray	
Ruetuu		
	Eagle Rays	Myliobatidae
Choचाio	Spotted eagle ray	<i>Aetobatis narinari</i>
	Manta Rays	
	Manta ray	<i>Manta alfredi</i>
	Sicklefin devil ray	<i>Mobula sp.</i>
	Cusk Eels	Ophidiformes
	Reef cusk eel	<i>Brotula multibarbata</i>
	Townsend's cusk eel	<i>Brotula townsendi</i>
	Livebearing Brotulas	Bythitidae
	Free-tailed reef brotula	<i>Brosomphyciops pautzkei</i>

	Yellow pygmy brotula	<i>Dinematichthys ilucoeteoides</i>
Cheremelamolech or Derirk	Pearlfishes	<i>Carapodidae</i>
Cheremelamolech or Derirk	Silver pearlfish	<i>Carapus homei</i>
	Pinchusion star pearlfish	<i>Carapus mourlani</i>
	Pinhead pearlfish	<i>Carapus parvipinnis</i>
	Graceful pearlfish	<i>Encheliophis gracilis</i>
	Worm pearlfish	<i>Encheliophis vermicularis</i>
	Bivalve pearlfish	<i>Onuxodon margaritifer</i>
	Pearlfishes	<i>Carapidae</i>
	Dragonfishes	<i>Pegasiformes</i>
	Dragonfishes	<i>Pegasidae</i>
	Short dragonfish	<i>Eurypegasus draconis</i>
	Basslets; Groupers	<i>Perciformes</i>
	Fairy Basslets & Groupers	<i>Serranidae</i>
Chubei	Redmouth grouper	<i>Aethaloperca roгаа</i>
Choloteachl	Whitelined grouper	<i>Anyperodon leucogrammicus</i>
Mengardelucheb, Mardelucheb, Mengardeluu	Peacock grouper; Blue-spotted grouper	<i>Cephalopholis argus</i>
	Brownbarred grouper	<i>Cephalopholis boenak</i>
Elewiki	Leopard grouper	<i>Cephalopholis leopardus</i>
Rukekai	Coral grouper	<i>Cephalopholis miniata</i>
	Harlequin grouper	<i>Cephalopholis polleni</i>
Bachungor	Cave grouper; Six-banded grouper	<i>Cephalopholis sexmaculata</i>
	Tomato grouper	<i>Cephalopholis sonnerati</i>
	Orange-red pigmy grouper	<i>Cephalopholis spiloparaea</i>
Ollos	Flagtail grouper	<i>Cephalopholis urodeta</i>
Melechcs	Pantherfish; Polkadot grouper(Humpback)	<i>Cromileptes altivelis</i>
	Snowy grouper	<i>Epinephelus caeruleopunctatus</i>
Chemirchorch, Mirchorch	Coral grouper	<i>Epinephelus corallicola</i>
	Brown-spotted grouper	<i>Epinephelus chlorostigma</i>
	Speckle Blue grouper	<i>Epinephelus dyctyophelus</i>
Temekai	Black-tipped grouper	<i>Epinephelus fasciatus</i>
Temekai		<i>Epinephelus flavocaeruleus</i>
Remochel (Meteungerel); Temekai	Blotchy grouper	<i>Epinephelus fuscoguttatus</i>
Keksau		<i>Epinephelus fuscus</i>
Meratch or Meratk	Hexagon grouper	<i>Epinephelus hexagonatus</i>
luch el temekai	Giant grouper	<i>Epinephelus lanceolatus</i>
	Snub nose grouper	<i>Epinephelus macrospilos</i>
	Highfin grouper	<i>Epinephelus maculatus</i>
	Malabar grouper	<i>Epinephelus malabricus</i>
	Blackspot honeycomb grouper	<i>Epinephelus melanostigma</i>
Chemirchorch or Mirchorch	Honeycomb grouper	<i>Epinephelus merra</i>
Ksau	Black Saddled grouper	<i>Epinephelus houlandi</i>
	Netfin grouper	<i>Epinephelus miliaris</i>
		<i>Epinephelus poecilnotus</i>
	Marbled grouper/Red tipped	<i>Epinephelus polyphkadion</i>
	Foursaddled grouper	<i>Epinephelus piloticeps</i>
		<i>Epinephelus summana</i>
Bachungor	Greasy grouper	<i>Epinephelus tauvina</i>
		<i>Epinephelus tukula</i>
Bekeurasengerruk or	White-margined grouper	<i>Gracila albomarginata</i>

Mardelucheb		
Tiau	Squaretail grouper; Squaretail coral trout	<i>Plectropomus areolatus</i>
Tiau, Katuultiau, Mokas	Saddleback grouper; Giant coral trout	<i>Plectropomus laevis</i>
Mokas	Leopard coral trout	<i>Plectropomus leopardus</i>
Katuultiau		<i>Plectropomus melanoleucus</i>
Basolokiil?	Bue lined coral trout	<i>Plectropomus oligacanthus</i>
Mokas	Giant coral grouper	<i>Plectropomus truncates</i>
	Whitemargin tyretail grouper	<i>Variola louti</i>
Basongokiil or Basolokiil	Lyretail grouper; Lyretail coral trout	<i>Variola louti</i>
	Pinstriped basslet	<i>Liopropoma mitratum</i>
	Manyline perch	<i>Liopropoma multilineatum</i>
	Pinstriped basslet	<i>Liopropoma susumi</i>
	Redstriped basslet	<i>Liopropoma tonstrinum</i>
	Magenta slender basslet	<i>Luzonichthys waitei (L. addisi)</i>
	Whitley's slender basslet	<i>Luzonichthys whitleyi</i>
	Red-cheeked fairy basslet	<i>Pseudanthias huchtii</i>
	Scalefin or Lyretail fairy basslet	<i>Pseudanthias squammipinnis</i>
	Red-bar fairy basslet	<i>Pseudanthias cooperi</i>
	Square-spot fairy basslet	<i>Pseudanthias pleurotaenia</i>
	Randall's fairy basslet	<i>Pseudanthias randalli</i>
	Bartlett's fairy basslet	<i>Pseudanthias</i>
	Peach fairy basslet	<i>Pseudanthias dispar</i>
	Bicolor fairy basslet	<i>Pseudanthias bicolor</i>
	Lori's anthias	<i>Pseudanthias lori</i>
	Purple queen	<i>Pseudanthias pascalus</i>
	Smithvaniz' fairy basslet	<i>Pseudanthias smithvanizi</i>
	Yellowstriped fairy basslet	<i>Pseudanthias tuka</i>
	Hawkfish anthias	<i>Serranocirrhitis latus</i>
	Pygmy basslet	<i>Plectranthias nanus</i>
	Soapies	<i>Leiognathidae</i>
Deluai	Tooth pony	<i>Gazza minuta</i>
Keyam	Common ponyfish	<i>Leiognathus equulus</i>
	Soapfishes	<i>Grammistidae</i>
	Chabanaud's soapfish	<i>Belonoperca chabanaudi</i>
	Skunkfish; Yellowstriped soapfish	<i>Grammistes sexlineatus</i>
	Ocellate soapfish	<i>Grammistops ocellatus</i>
	Twolined soapfish	<i>Pseudogramma bilinearis</i>
		<i>Pseudogramma polyacantha</i>
	Comet	<i>Calloplelesops altivelis</i>
	Red-tiped longfin	<i>Plesiops corallicola</i>
	Surge dottyback	<i>Pseudochromis cyanotaenia (P. tapienosoma)</i>
	Dusky dottyback	<i>Pseudochromis fuscus (P. aurea)</i>
	Long-finned dottyback	<i>Pseudochromis polynemus</i>
	Magenta dottyback	<i>Pseudochromis porphyreus</i>
	Black-banded dottyback	<i>Pseudochromis tapienosoma</i>
	Rose Island basslet	<i>Pseudoplesiops rosae</i>
	Hawkfishes	<i>Cirrhitidae</i>
	Two-spotted hawkfish	<i>Amblycirrhitis bimacula</i>
	Falco hawkfish	<i>Cirrhitichthys falco</i>
	Pixy hawkfish	<i>Cirrhitichthys oxycephalus</i>
Odiduerabong	Stocky hawkfish	<i>Cirrhitis pinnulatus</i>

	Flame hawkfish	<i>Neocirrhites armatus</i>
	Longnose hawkfish	<i>Oxycirrhites typus</i>
Merirchesengl	Arc-eye hawkfish	<i>Paracirrhites arcatus</i>
	Freckled hawkfish; Blackside hawkfish	<i>Paracirrhites forsteri</i>
	Whitespot hawkfish	<i>Paracirrhites hemistictus</i>
Basolokiil	Black side hawkfish	<i>Paracirrhites forsteri</i>
	Cardinalfishes	<i>Apogonidae</i>
	Ocellated cardinalfish	<i>Apogonichthys ocellatus</i>
	Perdix cardinalfish	<i>Apogonichthys perdix</i>
	Spotcheek cardinalfish	<i>Fowleria punctulata</i>
	Marbled cardinalfish	<i>Fowleria marmorata</i>
	Luminous cardinalfish	<i>Rhabdamia cypselurus</i>
	Black cardinalfish	<i>Apogon melas</i>
	Bandfin cardinalfish	<i>Apogon taeniopterus</i>
	Eyeshadow cardinalfish	<i>Apogon exostigma</i>
	Bridled cardinalfish	<i>Apogon fraenatus</i>
	Iridescent cardinalfish	<i>Apogon kallopterus</i>
	Redspot cardinalfish	<i>Apogon dispar</i>
	Hartzfeld's cardinalfish	<i>Apogon hartzfeldii</i>
	Sangi cardinalfish	<i>Apogon sangiensis</i>
	Bigeye cardinalfish	<i>Apogon bandanensis</i>
	Gray cardinalfish	<i>Apogon fuscus</i>
	Guam cardinalfish	<i>Apogon guamensis</i>
	Broadstriped cardinalfish	<i>Apogon angustatus</i>
	Reef-flat cardinalfish	<i>Apogon taeniophorus</i>
	Black-striped cardinalfish	<i>Apogon nigrofasciatus</i>
	Seven-striped cardinalfish	<i>Apogon novemfasciatus</i>
	Ochre-striped cardinalfish	<i>Apogon compressus</i>
	Seale's cardinalfish	<i>Apogon sealei</i>
	Yellow cardinalfish	<i>Apogon cyanosoma</i>
	Fragile cardinalfish	<i>Apogon fragilis</i>
	Gilbert's cardinalfish	<i>Apogon gilberti</i>
	Bluestreak cardinalfish	<i>Apogon leptacanthus</i>
	Pearly cardinalfish	<i>Apogon perlitus</i>
	Twinspot cardinalfish	<i>Archamia biguttata</i>
	Oranglined cardinalfish	<i>Archamia fucata</i>
	Blackbelted cardinalfish	<i>Archamia zosterophora</i>
	Pajama cardinalfish	<i>Sphaeramia nematoptera</i>
	Orbiculate cardinalfish	<i>Sphaeramia orbicularis</i>
	Dog-toothed cardinalfish	<i>Cheilodipterus isostigma</i>
	Lined cardinalfish	<i>Cheilodipterus artus</i>
	Large-toothed cardinalfish	<i>Cheilodipterus macrodon</i>
	Five-lined cardinalfish	<i>Cheilodipterus quinquelineata</i>
	B-spot cardinalfish	<i>Gymnpogon urospilotus</i>
	White-jawed cardinalfish	<i>Pseudamia amblyuroptera</i>
	Hayashi's cardinalfish	<i>Pseudamia hayashii</i>
	Gelatinous cardinalfish	<i>Pseudamia gelatinosa</i>
	Paddlefin cardinalfish	<i>Pseudamia zonata</i>
	Graceful-tailed cardinalfish	<i>Pseudamiops gracilicauda</i>
Sebus; Sebusmerand	Cardinalfishes	<i>Apogonidae</i>
	Grunters	<i>Theraponidae</i>
	Crescent-banded grunter	<i>Terapon jarbua</i>

	Flagtails	Kuhliidae
	Dark-margined flagtail	<i>Kuhlia marginata</i>
	Barred flagtail	<i>Kuhlia mugil</i>
	Rock flagtail	<i>Kuhlia rupestris</i>
	Bigeyes	Priacanthidae
	Glasseye	<i>Heteropriacanthus cruentatus</i>
Dechil ebakl or Dechil a deil	Google-eye	<i>Priacanthus hamrur</i>
	Sand tilefishes	Malacanthidae
	Stocky sand tilefish	<i>Hiplolatilus fronticinctus</i>
	Purple-headed sand tilefish	<i>Hoplolatilus starcki</i>
	Quakerfish	<i>Malacanthus brevirostris</i>
	Striped blanquillo	<i>Malacanthus latovittatus</i>
	Tilefish	Branchiostegidae
	Striped blanquillo	<i>Malacanthus latovittatus</i>
Baiei		<i>Malacanthus hoedtii</i>
Rekereked	Sharksuckers & Remoras	Echeneididae
Rekereked	Sharksucker	<i>Echeneis naucrates</i>
Rekereked	Remora	<i>Remora remora</i>
	Jacks & Trevallys	Carangidae
	Yellowtail scad	<i>Atule mate</i>
Ulekreoul	African pompano	<i>Alectis ciliaris</i>
	Mackerel scad	<i>Decapterus macarellus</i>
	Yellowband scad	<i>Sealar boops</i>
Terekriik	Bigeye scad; Atulai	<i>Selar crumenophthalmus</i>
	Threadfin pompano	<i>Alectis ciliaris</i>
	Indian threadfish	<i>Alectis indicus</i>
Wii	Golden trevally	<i>Gnathanodon speciosus</i>
	Shadow kingfish	<i>Carangoides dinema</i>
	Bar jack	<i>Carangoides ferdau</i>
lab	Yellow-dotted trevally	<i>Carangoides fulvoguttatus</i>
Otewot	Yellow-spotted trevally	<i>Carangoides orthogrammus</i>
	Barcheek trevally	<i>Carangoides plagiotaenia</i>
Cherobk or Chederobk	Giant trevally	<i>Caranx ignobilis</i>
Chomuktutau	Black jack	<i>Caranx lugubris</i>
Oruidel	Bluefin trevally	<i>Caranx melampygus</i>
Klspeached		<i>Caranx mate</i>
Oruidel	Brassy trevally	<i>Caranx papuensis</i>
Esuuch	Bigeye trevally	<i>Caranx sexfasciatus</i>
Yas	Leatherback; Lae	<i>Scomberoides lysan</i>
Desui	Rainbow runner	<i>Elagatis bipinnulatus</i>
Terekriik	Bigeye scad	<i>Selar crumenophthalmus</i>
	Greater amberjack	<i>Seriola dumerili</i>
Mekeim	Almaco jack	<i>Seriola rivoliana</i>
	Small-spotted pompano	<i>Trachinotus bailloni</i>
Luichlbuil	Silver pompano	<i>Trachinotus blochii</i>
Terekriik		<i>Trachurus boops</i>
Recherached	Whitetongue jack	<i>Uraspis helvola</i>
	Ponyfishes; Slipmouths	Leiognathidae
	Common slipmouth	<i>Leiognathus equulus</i>
Chedochd	Mojarras	Gerreidae
Chedochd	Deep-bodied mojarra	<i>Gerres crythrourus</i>
	Common mojarra	<i>Gerres argyreus</i>
	Filamentous mojarra	<i>Gerres filamentosus</i>

Chesall (sm), Kotikw (lg)	Oblong mojarra	<i>Gerres oblongatus</i>
	Oyena mojarra	<i>Gerres oyena</i>
Omoket		<i>Gerres punctatus</i>
	Whitings	<i>Sillaginidae</i>
Melechies	Silver sillago	<i>Sillago sihama</i>
	Snappers	<i>Lutjanidae</i>
Krong	Blue smalltooth jobfish	<i>Aphareus furca</i>
Metngui	Rusty jobfish	<i>Aphareus rutilans</i>
Udel	Jobfish; Uku	<i>Aprion virescens</i>
Edui	Blue-lined sea bream	<i>Symphorichthys spilurus</i>
Ulekiued	Fusilier	<i>Caesio spp.</i>
Sebus		<i>Etelis marshi</i>
Kedesaulyengel	River snapper	<i>Lutjanus argentimaculatus</i>
Kesebii	Two-spot snapper	<i>Lutjanus biguttatus</i>
Kotongl (sm), Kedesau (lg)	Red snapper; Twinspot snapper	<i>Lutjanus bohar</i>
	Checkered snapper	<i>Lutjanus decussates</i>
	Blackspot snapper	<i>Lutjanus ehrenberi</i>
Reyall or Kesebii	Flametail snapper	<i>Lutjanus fulvus</i>
Keremlal	Humpback snapper	<i>Lutjanus gibbus</i>
	Bluelined snapper	<i>Lutjanus kasmira</i>
Sebus	Malabar snapper	<i>Lutjanus malabricus</i>
Derringel	Onespot snapper	<i>Lutjanus monostigmus</i>
	Scribbled snapper	<i>Lutjanus rivulatus</i>
	Half-barred snapper	<i>Lutjanus semicinctus</i>
Dodes	One-lined snapper	<i>Lutjanus vitta</i>
Sakuradei		<i>Lutjanus sp.</i>
Debull or Mengeselblad		<i>Lutjanus sp.</i>
	Black-and-white snapper	<i>Macolor macularis</i>
Ngkalalk	Black snapper	<i>Macolor niger</i>
Sebus		<i>Pristipomoides brighami</i>
Metengui	Crimson jobfish	<i>Pristopomodes filamentosus roseus</i>
	Lavender jobfish	<i>Pristopomes sieboldii</i>
Turang	Oblique-banded snapper	<i>Pristipomoides zonatus</i>
Ulekiued	Fusslier	<i>Pterocaesio spp.</i>
Akamuro	Fusiliers	<i>Caesionidae</i>
	Lunar fusilier	<i>Caesio lunaris</i>
	Yellowback fusilier	<i>Caesio teres</i>
	Yellowstreak fusilier	<i>Pterocaesio lativittata</i>
	Bluestreak fusilier	<i>Pterocaesio tile</i>
	Ruddy fusilier	<i>Pterocaesio pisang</i>
	Three-striped fusilier	<i>Pterocaesio trilineata</i>
	Grunts & Sweetlips	<i>Haemulidae</i>
Debelich	Slatey sweetlips	<i>Diagramma pictum</i>
	Two-stripe d sweetlips	<i>Plectorhinchus albivittatus</i>
Merar	Celebes sweetlips	<i>Plectorhinchus celebicus</i>

Bochol	Harlequin sweetlips	<i>Plectorhinchus chaetodonoides</i>
Korriu	Lined sweetlips	<i>Plectorhinchus gaterinoides</i>
	Gibbus sweetlips	<i>Plectorhinchus gibbosus</i>
Yaos	Goldman's sweetlips	<i>Plectorhinchus goldmanni</i>
Melimraim(sm), Bikl (lg)	Giant sweetlips	<i>Plectorhinchus obscurus</i>
Yaos	Oriental sweetlips	<i>Plectorhinchus orientalis</i>
	Spotted sweetlips	<i>Plectorhinchus picus</i>
Besechamel (sm), Mekedchelwel (lg)		<i>Pomadasyus hasta</i>
	Common javelin fish	<i>Pomadasyus kaakan</i>
	Twoline spinecheek	<i>Scolopsis bilineatus</i>
	Ciliate spinecheek	<i>Scolopsis ciliatus</i>
	Black-and-white spiecheek	<i>Scolopsis lineatus</i>
	Margarite's spinecheek	<i>Scolopsis Margaritifera</i>
	Spinecheek	<i>Scolopsis affinis</i>
	Three- lined spinecheek	<i>Scolopsis trilineatus</i>
	Emperors	<i>Lethrinidae</i>
Ulekiull or Bodes	Yellowspot emperor	<i>Gnathodentex aurolineatus</i>
Metengui		<i>Gymnocranius japonicus</i>
Rekruk	Ambon emperor	<i>Lethrinus amboinensis</i>
	Yellowbrow emperor	<i>Lethrinus atkinsoni</i>
Melangmud	Longnose emperor	<i>Lethrinus elongates</i>
	Orangefin emperor	<i>Lethrinus erythracanthus</i>
	Masked emperor	<i>Lethrinus erythropterus</i>
Chudch	Longspine emperor	<i>Lethrinus genivittatus</i> (<i>L. nematacanthus</i>)
Metengui?		<i>Lethrinus haematopterus</i>
Chudch		<i>Lethrinus nemata canthus obsoletus</i>
Itotech	Blackspot emperor/Thumbprint	<i>Lethrinus harak</i>
Menges		<i>Lethrinus kallopterus</i>
Mechur	Redspot emperor	<i>Lethrinus lentjan</i>
Krol		<i>Lethrinus mahsena</i>
Metengui	Yellow-brown emperor/pink ear	<i>Lethrinus mahsenoides</i>
Mlangmud	Smalltooth emperor	<i>Lethrinus Microdon</i>
Mechur		<i>Lethrinus Miniatus</i>
Chudech	Orange-striped emperor	<i>Lethrinus nemata canthus, L. obsoletus</i>
Itotech	Blackspot emperor/Thumbprint	<i>Lethrinus harak</i>
Menges		<i>Lethrinus kallopterus</i>
Mechur	Redspot emperor	<i>Lethrinus lentjan</i>
Krol		<i>Lethrinus mahsena</i>
Metengui	Yellow-brown emperor/pink ear	<i>Lethrinus mahsenoides</i>
Mechur		<i>Lethrinus Microdon</i>
Mlangmud	Smalltooth emperor	<i>Lethrinus Miniatus</i>
Mechur		<i>Lethrinus Miniatus</i>
Chudech	Orange-striped emperor	<i>Lethrinus nemata canthus, L. obsoletus</i>
	Yellowstripe emperor	<i>Lethrinus obsoletus</i>
	Longnose emperor	<i>Lethrinus olivaceus</i>
	Ornate emperor	<i>Lethrinus ornatus</i>
	Redgill emperor	<i>Lethrinus rubrioperculatus</i>
	Reef flat emperor	<i>Lethrinus semicinctus</i>
	Slender emperor	<i>Lethrinus variegates</i>

Mechur	Yellowlip emperor	<i>Lethrinus xanathochilus</i>
Elawikl		<i>Lethrinus sp.</i>
Rekruk		<i>Lethrinus sp.</i>
Itotech	Thumbprint emperor	<i>Lethrinus sp.</i>
Besechamel	Bigeye emperor	<i>Monotaxis grandoculis</i>
	Pink okapaka/Crimson jobfish	<i>Pristopomoides filamentosus roseus</i>
Metengui	Lavender jobfish	<i>Pristopomoides sieboldii</i>
Kiliibeitaochell	Lethrind	
Metnguilitoachel	Lethrind	
Chesichucher	Lethrind	
	Goatfishes	Mullidae
Dech	Yellowstripe goatfish	<i>Mulloidides flavolineatus</i>
	Yellowfin goatfish	<i>Mulloidides vanicolensis</i>
Chemisech		<i>Mulloidichthys samoensis</i>
	Half-and-half goatfish	<i>Parupeneus barberinoides</i>
Bang	Dash-and-dot goatfish	<i>Parupeneus barberinus</i>
Chedebedobr	Two-barred goatfish	<i>Parupeneus bifasciatus</i>
Oiachd, Turanglbang	Yellowsaddle goatfish; Yellow	<i>Parupeneus cyclostomus</i>
	Redspot goatfish	<i>Parupeneus heptacanthus</i>
Idebsungl	Indian goatfish	<i>Parupeneus indicus</i>
	Multibarred goatfish	<i>Parupeneus multifasciatus</i>
	Sidespot goatfish	<i>Parupeneus pleurostigma</i>
	Banded-tailed goatfish	<i>Parupeneus taeniopterus</i>
Bang		<i>Parupeneus trifasciatus</i>
Uleangl	Blackstriped goatfish	<i>Upeneus tragula</i>
Uleangl	Yellow striped goatfish	<i>Upeneus vittatus</i>
	Sweepers	Pempheridae
	Pigmy sweeper	<i>Parapriacanthus ransonneti</i>
	Bronze sweeper	<i>Pempheris ovalensis</i>
	Rudderfishes; Sea Chubs	Kyphosidae
Keichul(sm); Kokmud(lg)	Highfin rudderfish; Snubnose chub	<i>Kyphosus cinerascens</i>
Keichul(sm); Kokmud(lg)	Lowfin rudderfish; Brassy chub	<i>Kyphosus vaigiensis</i>
	Monos	Monodactylidae
	Mono	<i>Monodactylus argenteus</i>
	Scats	Scatophagidae
	Scat	<i>Scatophagus argus</i>
	Batfishes; Spadefishes	Ephippidae
	Circular spadefish; Batfish	<i>Platax orbicularis</i>
Llelameduu (sm); Bulls (lg)	Pinnate spadefish	<i>Platax pinnatus</i>
	Longfin spadefish	<i>Platax teira</i>
Chelbesoi (all except for C. unimaculatus)	Butterflyfishes	Chaetodontidae
Chelebsoi	Threadfin butterflyfish	<i>Chaetodon auriga</i>
	Eastern triangular butterflyfish	<i>Chaetodon barronessa</i>
	Bennet's butterflyfish	<i>Chaetodon benneti</i>
	Burgess's butterflyfish	<i>Chaetodon burgessi</i>
	Speckled butterflyfish	<i>Chaetodon citrinellus</i>
	Saddled butterflyfish	<i>Chaetodon ephippium</i>
	Klein's butterflyfish	<i>Chaetodon kleinii</i>
	Lined butterflyfish	<i>Chaetodon lineolatus</i>
	Raccon butterflyfish	<i>Chaetodon lunula</i>

	Black-backed-butterflyfish	<i>Chaetodon melannotus</i>
	Merten's butterflyfish	<i>Chaetodon mertensii</i>
	Meyer's butterflyfish	<i>Chaetodon meyeri</i>
	Spot-tail butterflyfish	<i>Chaetodon ocellicaudus</i>
	Eight-banded butterflyfish	<i>Chaetodon octofasciatus</i>
	Ornate butterflyfish	<i>Chaetodon ornatissimus</i>
	Spot-nape butterflyfish	<i>Chaetodon oxycephalus</i>
	Spot-banded butterflyfish	<i>Chaetodon unimaculatus</i>
	Latticed butterflyfish	<i>Chaetodon rafflessi</i>
	Reticulated butterflyfish	<i>Chaetodon reticulatus</i>
	Dotted butterflyfish	<i>Chaetodon semeion</i>
	Oval butterflyfish	<i>Chaetodon speculum</i>
	Chevroned butterflyfish	<i>Chaetodon trifascialis</i>
	Redfin butterflyfish	<i>Chaetodon trifasciatus</i>
	Pacific double-saddle butterflyfish	<i>Chaetodon ulietensis</i>
	Teardrop butterflyfish	<i>Chaetodon unimaculatus</i>
	Vegabon butterflyfish	<i>Chaetodon vagabundus</i>
Chelebsoi	Orange-banded coralfish	<i>Coradion chrysozonus</i>
Chelebsoi	Long-nosed butterflyfish	<i>Forcipiger flavissimus</i>
	Big long-nosed butterflyfish	<i>Focipiger longirostris</i>
	Pyramid butterflyfish	<i>Hemitaurichthys polyepis</i>
Kaming	Long-fin bannerfish	<i>Heniochus acuminatus</i>
	Pennant bannerfish	<i>Heniochus chrysostomus</i>
	Masked bannerfish	<i>Heniochus monoceros</i>
	Singular bannerfish	<i>Heniochus singularis</i>
	Humphead bannerfish	<i>Heniochus varius</i>
	Angelfishes	<i>Pomacanthidae</i>
	Three-spot angelfish; Flagfin angelfish	<i>Apolemichthys trimaculatus</i>
	Bicolor angelfish	<i>Centropyge bicolor</i>
Ngemngumk	Two-spined angelfish; Dusky angelfish	<i>Centropyge bispinosus</i>
	Colin's angelfish	<i>Centropyge coloni</i>
	White-tail	<i>Centropyge flavicauda</i>
	Lemonpeel	<i>Centropyge flavissimus</i>
	Herald's	<i>Centropyge heraldi</i>
	Flame	<i>Centropyge loriculus</i>
	Multibarred	<i>Centropyge multifasciatus</i>
	Midnight	<i>Centropyge nox</i>
	Keyhole	<i>Centropyge tibicen</i>
Mud		<i>Centropyge spp.</i>
	Blackspot	<i>Genicanthus melanospilos</i>
Ngemngumk	Regal	<i>Pygoplites diacanthus</i>
	Vermiculated	<i>Chaetodontoplus mesoleucus</i>
Klbou	Emperor angelfish	<i>Pomacanthus imperator</i>
	Blue-gridled	<i>Pomacanthus navarchus</i>
	Yellow-faced angelfish; Blue-faced angelfish	<i>Pomacanthus xanthometopon</i>
	Emperor angelfish	<i>Pomacanthus imperator</i>
	Semicircle angelfish	<i>Pomacanthus semicirculatus</i>
	Damselfishes	<i>Pomacentridae</i>
	Orange-fine anemonefish	<i>Amphiprion chrysopterus</i>
	Clark's anemonefish	<i>Amphiprion clarkii</i>
	Dusky anemonefish	<i>Amphiprion melanopus</i>

	Pink anemonefish	<i>Amphiprion perideraion</i>
Cheremelamerand	Yellow-speckled chromis	<i>Chromis alpha</i>
	Ambon chromis	<i>Chromis amboinensis</i>
	Yellow chromis	<i>Chromis analis</i>
	Black-axil chromis	<i>Chromis atripectoralis</i>
	Dark-fin chromis	<i>Chromis atripes</i>
	Blue-axil chromis	<i>Chromis caudalis</i>
	Deep reef chromis	<i>Chromis delta</i>
	Twin-spot chromis	<i>Chromis elerae</i>
	Scaly chromis	<i>Chromis lepidolepis</i>
	Lined chromis	<i>Chromis lineata</i>
	Bicolor chromis	<i>Chromis margaritifer</i>
	Ternate chromis	<i>Chromis ternatensis</i>
	Vanderbilt's chromis	<i>Chromis vanderbelti</i>
	Blue-green chromis	<i>Chromis viridis</i>
	Weber's chromis	<i>Chromis weberi</i>
	Yellow-axil chromis	<i>Chromis xanthochir</i>
	Black chromis	<i>Chromis xanthura</i>
Cheremelamerand	Humbug dascyllus	<i>Dascyllus aruanus</i>
	Black-tail dascyllus	<i>Dascyllus melanurus</i>
	Reticulated dascyllus	<i>Dascyllus reticulatus</i>
	Three-spot dascyllus	<i>Dascyllus trimaculatus</i>
	Fusilier damsel	<i>Lepidozygus tapienosoma</i>
	Big-lip damsel; Minstrel fish	<i>Cheiloprion labiatus</i>
Kllibei	Bengal sergeant	<i>Abudefduf bengalensis</i>
Mud?	Black-tail sergeant	<i>Abudefduf lorenzi</i>
	Yellow-axil chromis	<i>Chromis xanthochir</i>
	Yellow-tail sergeant	<i>Abudefduf notatus</i>
	Sergeant-major	<i>Abudefduf vaigiensis</i>
	Banded sergeant	<i>Abudefduf septemfasciatus</i>
	Scissor-tail sergeant	<i>Abudefduf sexfasciatus</i>
Kllibei	Black-spot sergeant	<i>Abudefduf sordidus</i>
	Golden damsel	<i>Amblyglyphidodon aureus</i>
	Staghorn damsel	<i>Amblyglyphidodon curacao</i>
	White-belly damsel	<i>Amblyglyphidodon leucogaster</i>
	Ternate damsel	<i>Amblyglyphidodon ternatensis</i>
	Two-spot demoiselle	<i>Chrysiptera biocellata</i>
	Blue devil	<i>Chrysiptera cyanea</i>
	Gray demoiselle	<i>Chrysiptera glauca</i>
	Surge demoiselle	<i>Chrysiptera leucopoma</i>
	Blue-spot demoiselle	<i>Chrysiptera oxycephala</i>
	King demoiselle	<i>Chrysiptera rex</i>
	Talbot's demoiselle	<i>Chrysiptera talboti</i>
	Tracey's demoiselle	<i>Chrysiptera traceyi</i>
	One-spot demoiselle	<i>Chrysiptera unimaculata</i>
	White-spot damsel	<i>Dischistodus chrysopoecilus</i>
	Back-vent damsel	<i>Dischistodus melanotus</i>
	White damsel	<i>Dischistodus perspicillatus</i>
	Giant farmer fish	<i>Hemiglyphidodon plagiometopon</i>
	Coral demoiselle	<i>Neopomacentrus nemurus</i>
	Fresh-water demoiselle	<i>Neopomacentrus taeniurus</i>
	Royal damsel	<i>Neoglyphidodon melas</i>
	Yellowfin damsel	<i>Neoglyphidodon nigroris</i>

	Dick's damsel	<i>Plectroglyphidodon imparipennis</i>
	Bright-eye damsel	<i>Plectroglyphidodon imparipennis</i>
	Johnston Island damsel	<i>Plectroglyphidodon johnstonianus</i>
	Jewel damsel	<i>Plectroglyphidodon lacrymatus</i>
	White-band damsel	<i>Plectroglyphidodon leucozonus leucozonus</i>
Mud	Ambon damsel	<i>Pomacentrus amboinensis</i>
	Speckled-fin damsel; Nagasaki damsel	<i>Pomacentrus nagasakiensis</i>
	Speckled damsel	<i>Pomacentrus bankanensis</i>
	Burrough's damsel	<i>Pomacentrus burroughi</i>
	Neon damsel	<i>Pomacentrus coelestis</i>
	White-tail damsel	<i>Pomacentrus chrysurus</i> (<i>p. rhodonotus</i> ; <i>P. flavicauda</i> ?)
	Outer-reef damsel	<i>Pomacentrus emarginatus</i>
	Blue-spot damsel	<i>Pomacentrus grammorhynchus</i>
	Lemon damsel	<i>Pomacentrus moluccensis</i>
	Black-axil damsel	<i>Pomacentrus nigromanus</i>
	Sapphire damsel	<i>Pomacentrus pavo</i>
	Reid's damsel	<i>Pomacentrus reidi</i>
	Blueback damsel	<i>Pomacentrus simsiang</i>
	Dusky damsel	<i>Pomacentrus sp.</i>
	Princess damsel	<i>Pomacentrus vaiuli</i>
	White-bar Gregory	<i>Stegastes albifasciatus</i>
	Pacific Gregory	<i>Stegastes fasciolatus</i>
	Blunt snout Gregory; Farmerfish	<i>Stegastes lividus</i>
	Dusky farmerfish	<i>Stegastes nigricans</i>
Cher	Six-banded	<i>Euxiphipops sextriatus</i>
Ngemngumk		<i>Euxiphipops xanthometapon</i>
	Wrasses	Labridae
	Axilspot hogfish	<i>Bodianus axillaries</i>
	Two-spot slender hogfish	<i>Bodianus bimaculatus</i>
	Diana's hogfish	<i>Bodianus Diana</i>
	Mesothorax hogfish	<i>Bodianus mesothorax</i>
Budech; Eitin	Yellow-cheeked tuskfish	<i>Choerodon anchorago</i>
Budech		<i>Choerodon azurio</i>
Udoudungelel	Chiseltooth wrasse	<i>Pseudodax moluccanus</i>
	Arenatus wrasse	<i>Cheilinus arenatus</i>
	Twospot wrasse	<i>Cheilinus bimaculatus</i>
	Celebes wrasse	<i>Cheilinus celebecus</i>
	Floral wrasse	<i>Cheilinus chlorourus</i>
	Bandcheeck wrasse	<i>Cheilinus digrammus</i>
Kerdeu	Red-breasted wrasse	<i>Cheilinus fasciatus</i>
Adeyaoch	Tripletail wrasse	<i>Cheilinus trilobatus</i>
Ngimr (sm), Didmecheilmaml	Humphead wrasse	<i>Cheilinus undulates</i>
	Ringtail wrasse	<i>Cheilinus unifasciatus</i>
	Black-spot pigmy wrasse	<i>Wetmorella nigropinnata</i>
Ngerengerodl	Slingjaw wrasse	<i>Epibulus insidiator</i>
	Slingjaw wrasse	<i>Epibulus insidiator</i>
	Dragon wrasse; Rockmover wrasse	<i>Novaculichthys taeniourus</i>
	Blueside wrasse	<i>Cirrhilabrus cyanopleura</i>
	Exquisite wrasse	<i>Cirrhilabrus exquisitus</i>
	Striated wrasse	<i>Pseudocheilinus evanidus</i>

	Sixline wrasse	<i>Pseudocheilinus hexataenia</i>
	Eighline wrasse	<i>Pseudocheilinus octotaenia</i>
	Cryptic wrasse	<i>Pterogogus cryptus</i>
	Sneaky wrasse	<i>Pterogogus guttatus</i>
	Blue-spotted wrasse	<i>Anampses caeruleopuntatus</i>
Udoudungelel	Black-spot gigmy wrasse?	<i>Anampses caeruleopuntatus</i>
	Geographic wrasse	<i>Anampses geographicus</i>
	White-spotted wrasse	<i>Anampses melanurus</i>
	Yellowtail wrasse	<i>Anampses meleagrides</i>
	Yellow-breasted wrasse	<i>Anampses twisti</i>
Ngiuut	Cigar wrasse	<i>Cheilio inermis</i>
Uluch	Clown coris	<i>Coris aygula</i>
Dudalm	Yellowtail coris	<i>Coris gaimard</i>
	Dapple coris	<i>Coris variegata</i>
Merirchesengl	Bird wrasse	<i>Gomphosus varius</i>
	Two-spotted wrasse	<i>Halichoeres biocellatus</i>
	Pastel-green wrasse	<i>Halichoeres chloropterus</i>
	Checkerboard wrasse	<i>Halichoeres hortulanus</i>
	Weedy surge wrasse	<i>Halichoeres margaritaceus</i>
	Dusky wrasse	<i>Halichoeres marginatus</i>
	Pinstriped wrasse	<i>Halichoeres melanurus</i>
	Black-ear wrasse	<i>Halichoeres melasmapomus</i>
	Two-tone wrasse	<i>Halichoeres prospeion</i>
	Richmond's wrasse	<i>Halichoeres richmondii</i>
	Zigzag wrasse	<i>Halichoeres scapularis</i>
	Three-spot wrasse	<i>Halichoeres trimaculatus</i>
	Barred thicklip	<i>Hemigymnus fasciatus</i>
	Half-and-half wrasse (juv.); Blackedge thicklip wrasse (adult)	<i>Hemigymnus melapterus</i>
	Leopard wrasse	<i>Macropharyngodon meleagris</i>
	Negros wrasse	<i>Macropharyngodon negrosensis</i>
	Yamashiro's wrasse	<i>Pseudocoris yamashiroi</i>
Tilobed rechomesangl	Red-shoulder wrasse	<i>Stethojulis bandanensis</i>
	Three-ribbon wrasse	<i>Stethojulis</i>
	Bluehead Wrasse	<i>Thalassoma amblycephalum</i>
	Sixbar wrasse	<i>Thalassoma hardwickii</i>
	Jansen's wrasse	<i>Thalassoma janseni</i>
	Crescent wrasse	<i>Thalassoma lunare</i>
	Sunset wrasse	<i>Thalassoma lutescens</i>
Sechiir(ma), Ngot(fe)	Surge wrasse	<i>Thalassoma purpureum</i>
	Five-stripe surge wrasse	<i>Thalassoma quinquevittatum</i>
	Christmas wrasse	<i>Thalassoma trilobatum</i>
	Wandering cleaner wrasse	<i>Diproctacanthus xanthurus</i>
	Tubelip wrasse	<i>Labrichthys unilineatus</i>
	Bicolor cleaner wrasse	<i>Labroides bicolor</i>
Tengadidik	Bluestreak cleaner wrasse	<i>Labroides dimidiatus</i>
	Black-spot cleaner wrasse	<i>Labroides pectoralis</i>
	Allen's wrasse	<i>Labropsis alleni</i>
	Micronesian wrasse	<i>Labropsis micronesica</i>
Sisir	Wrasse	<i>Halichoeres spp.</i>
Klsieb	Blackeye thicklip	<i>Hemigymnus melapterus</i>
Telebakl(ma), Ngot(fe)		<i>Thalassoma fuscum</i>
	Parrotfishes	<i>Scaridae</i>

Berdebed(sm), Kemedukl(Ig)	Humphead parrotfish	<i>Bolbometopon muricatum</i>
	Bucktooth parrotfish; Stareye parrotfish	<i>Calotomus carolinus</i>
Dekedekuuked	Spinytooth parrotfish	<i>Calotomus spinidens</i>
Beadl, Ngesngis (ma)	Bicolor parrotfish	<i>Cetoscarus bicolor</i>
Ngiaoch	Pacific longnose parrotfish	<i>Hipposcarus longiceps</i>
Kesuu	Seagrass parrotfish	<i>Leptoscarus vaigiensis</i>
Mesekelatlelebt	Ember parrotfish	<i>Scarus rubroviolaceus sp?</i>
	Filament-finned parrotfish	<i>Scarus altipinnis</i>
	Red parrotfish; bluechin parrotfish	<i>Scarus atropectoralis</i>
Besachelutengl	Bleeker's parrotfish	<i>Scarus bleekeri</i>
Ngemoil		<i>Scarus blotchi</i>
	Bower's parrotfish	<i>Scarus bowersi</i>
	Chameleon parrotfish	<i>Scarus bleekeri</i>
Mesekelat		<i>Scarus chlorodon</i>
	Turquoise-capped parrotfish	<i>Scarus dimidiatus</i>
	Festive parrotfish	<i>Scarus festivus</i>
	Yellowfin parrotfish	<i>Scarus flavipectoralis</i>
Mul	Forsten's parrotfish	<i>Scarus forsteni</i>
	Vermiculate parrotfish	<i>Scarus frenatus</i>
Telebaki, Chelobtechukl, Molokidubch (ma)	Blue-barred parrotfish	<i>Scarus ghobban</i>
Chotord		<i>Scarus gibbus</i>
Ngemoil, Chelebt, Butiliang	Roundhead parrotfish	<i>Scarus globiceps</i>
Ngyaoch(sm), Bergism (Ig)		<i>Scarus harid</i>
	Java parrotfish/Yellowtail parrotfish	<i>Scarus hypselopterus</i>
Mesekelat		<i>Scarus lepidus</i>
Chotored	Steephead parrotfish	<i>Scarus microhinos</i>
Butliliang	Black parrotfish/Swarthy parrotfish	<i>Scarus niger</i>
Uloiltoachel, Butliliang (ma); Melemau	Dark-capped parrotfish	<i>Scarus oviceps</i>
	Greenthroat parrotfish	<i>Scarus prasiognathos</i>
	Palenose parrotfish	<i>Scarus psittacus</i>
	Quoy's parrotfish	<i>Scarus quoyi</i>
	Rivulated parrotfish	<i>Scarus rivulatus</i>
Mellemau	Redlip parrotfish	<i>Scarus rubroviolaceus</i>
	Yellowband parrotfish	<i>Scarus schlegeli</i>
Mesekelat, Ngesngis(ma)	Bi-color parrotfish	<i>Scarus sexvittatus</i>
Derbetelloi, Butliliang(ma)	Bullethead parrotfish	<i>Scarus sordidus</i>
	Pigmy parrotfish	<i>Scarus spinus</i>
	Pale-margined parrotfish	<i>Scarus n. sp.?</i>
Kiuid, Mengetaoch(ma)		<i>Scarus venosus</i>
Udoudungelel		<i>Scarus xanthochir</i>
	Mullet	Mugilidae
Chesau or Uluu	Squartail	<i>Ellochelon vaigiensis</i>
Bliich(sm) Kelat (Ig)	Fringelip mullet	<i>Crenimugil crenilabis</i>
	Ceram mullet	<i>Liza ceramensis</i>
	Giantscale mullet	<i>Liza melinoptera</i>
	Yellowtail mullet; Squartail	<i>Liza vaigiensis</i>
lokedch		<i>Mugil ceramensis</i>
	Bluespot mullet	<i>Valemugil seheli</i>
	Threadfins	Polynemidae
Klakmil	Sixfeeler threadfin	<i>Polydactylus sexfilis</i>

	Barracudas	<i>Sphyraenidae</i>
	Sharpfin barracuda	<i>Sphyraena acutipinnis</i>
Mersoad(sm), Mordubch(m), Ai(lg)	Great barracuda	<i>Sphyraena barracuda</i>
Meai	Blackspot barracuda	<i>Sphyraena forsteri</i>
Meai	Blackfin barracuda	<i>Sphyraena genie</i>
	Arrow barracuda	<i>Sphyraena novaehollandiae</i>
Triidlmaml(lg)		<i>Sphyraena novaehollandiae</i>
	Sandperches	<i>Pinguipedidae</i>
	Latticed sandperch	<i>Parapercis clathrata</i>
	Cylindrical sandperch	<i>Parapercis cylindrical</i>
	Black-dotted sandperch	<i>Parapercis millipunctata</i>
	Blotchlip sandperch	<i>Parapercis xanthozona</i>
	Triplefins	<i>Tripterygiidae</i>
	Hooded triplefin	<i>Helcogramma capidata</i>
	Little hooded triplefin	<i>Helcogramma chica</i>
	Blennies	<i>Blenniidae</i>
	Highfin blenny	<i>Atrosalarias fuscus holomelas</i>
	Chestnut blenny	<i>Cirripectes castaneus</i>
	Spotted blenny	<i>Cirripectes fuscoguttatus</i>
	Flaming blenny	<i>Cirripectes perustus</i>
	Barred blenny	<i>Cirripectes polyzona</i>
	Sqiggly blenny	<i>Cirripectes quagga</i>
	Red-streaked blenny	<i>Cirripectes stigmaticus</i>
	Leopard blenny	<i>Exalias brevis</i>
	Bicolor blenny	<i>Ecsenius bicolor</i>
	Comical blenny	<i>Ecsenius opsifrontalis</i>
	Saddle blenny	<i>Ecsenius sellifer</i>
	Yaeyama blenny	<i>Ecsenius yaeyamaensis</i>
	Tail-barred rockskipper	<i>Entomacrodus caudofasciatus</i>
	Seale's rockskipper	<i>Entomacrodus cymatobiotus</i>
	Pearly rockskipper	<i>Entomacrodus striatus</i>
	Reef margin blenny	<i>Entomacrodus thalassinus thalassinus</i>
	Red-spotted blenny	<i>Blenniella chrysospilos</i>
	Rippled rockskipper	<i>Istiblennius edentulous</i>
	Lined	<i>Istiblennius lineatus</i>
	Blue-dashed rockskipper	<i>Istiblennius periophthalmus</i>
	Fowler's rockskipper	<i>Istiblennius fowleri</i>
	Snow's rockskipper	<i>Rhabdoblennius snowi</i>
	Jeweled blenny	<i>Rhabdoblennius fasciatus</i>
	Segmented blenny	<i>Salarias segmentatus</i>
	Spot-cheek blenny	<i>Salarias sp.</i>
	Seychelle's blenny	<i>Stanulus seychellensis</i>
	Mangrove blenny	<i>Omobranchus rotundiceps obliquus</i>
	Omx blenny	<i>Omx biporos</i>
	Lance blenny	<i>Aspidontus dussumieri</i>
	Cleaner mimic	<i>Aspidontus taeniatus taeniatus</i>
	Poison-fang blenny	<i>Meiacanthus atrodorsalis</i>
	Striped poison-fang blenny	<i>Meiacanthus grammistes</i>
	Poison-fang blenny mimic	<i>Plagiotremus laudandus laudandus</i>
	Bluestriped blenny	<i>Plagiotremus rhynorhynchus</i>
	Piano blenny; Scale-eating blenny	<i>Plagiotremus tapiensoma</i>
	Striped poison-fang blenny mimic	<i>Petroscirtes breviceps</i>

	Floral blenny	<i>Petroscirtes mitratus</i>
	Thepa's sabretooth blenny	<i>Petroscirtes thepasi</i>
	Variable sabretooth blenny	<i>Petroscirtes variabilis</i>
	Xestus sabretooth blenny	<i>Petroscirtes xestus</i>
	Japanese snake blenny	<i>Xiphasia matsubarai</i>
	Dragonets	<i>Callionymidae</i>
	Tentacled dragonet	<i>Anaora tentaculata</i>
	Delicate dragonet	<i>Callionymus delicatulus</i>
	Mangrove dragonet	<i>Callionymus enneactis</i>
	Simple-spined dragonet	<i>Callionymus simplicicornis</i>
	Goram dragonet	<i>Diplogrammus goramensis</i>
	Ladd's dragonet	<i>Synchiropus laddi</i>
	Morrison's dragonet	<i>Synchiropus morrisoni</i>
	Ocellated dragonet	<i>Synchiropus ocellatus</i>
	Mandarinfish	<i>Synchiropus splendidus</i>
	Dartfishes; Hovergobies; wormfishes	<i>Microdesmidae</i>
	Onespot wormfish	<i>Gunnellichthys monostigma</i>
	Onestripe wormfish	<i>Gunnellichthys pleurotaenia</i>
	Seychelle's wormfish	<i>Paragunnellichthys seychellesnsis</i>
	Blackfin dartfish	<i>Ptereleotris evides</i>
	Pearly dartfish	<i>Ptereleotris microlepis</i>
	Decorated dartfish	<i>Nemateleotris decora</i>
	Helfrich's dartfish	<i>Nemateleotris helfrichi</i>
	Fire dartfish; Fire goby	<i>Nemateleotris magnifica</i>
	Beautiful hover goby	<i>Parioglossus formosus</i>
	Lined hover goby	<i>Parioglossus lineatus</i>
	Naked hover goby	<i>Parioglossus nudus</i>
	Palustris hover goby	<i>Parioglossus palustris</i>
	Rainford's hover goby	<i>Parioglossus raifordi</i>
	Taeniatus hover goby	<i>Parioglossus taeniatus</i>
	Gobies	<i>Gobiidae</i>
	Giant prawn-goby	<i>Amblyeleotris fontaseni</i>
	Spotted prawn-goby	<i>Amblyeleotris guttata</i>
	Randall's prawn-goby	<i>Amblyeleotris randalli</i>
	Steinitz' prawn-goby	<i>Amblyeleotris steinitzi</i>
	Banded prawn-goby	<i>Cryptocentrus cinctus</i>
	Blue-speckled prawn-goby	<i>Cryptocentrus octafasciatus</i>
	Singapore prawn-goby	<i>Cryptocentrus singaporensis</i>
	Gold-streaked prawn goby	<i>Ctenogobiops aurocingulus</i>
	Ornate prawn-goby	<i>Vanderhorstia ornatissima</i>
	Corsshatch goby	<i>Amblygobius decussatus</i>
	Hector's goby	<i>Amblygobius hectori</i>
	Old glory; Rainford's goby	<i>Amblygobius rainfordi</i>
	Blue-spotted hole goby	<i>Oplopomus oplopomus</i>
	Signal goby; Crab-eye goby	<i>Signigobius biocellatus</i>
	Mural goby	<i>Valenciennea muralis</i>
	Blue-streak goby	<i>Valenciennea strigata</i>
	Mangrove goby	<i>Acentrogobius sp.</i>
	Dudky frill-goby	<i>Bathygobius fuscus fuscus</i>
	Gorgonian goby	<i>Bryaninops amplus</i>
	Whip coral goby	<i>Bryaninops youngei</i>
	Hasselt's goby	<i>Callogobius hasselti</i>
	Spotted fringe-fin goby	<i>Eviota albolineata</i>

	Comet pygmy goby	<i>Eviota cometa</i>
	Twospot pygmy goby	<i>Eviota distigma</i>
	Barred pygmy goby	<i>Eviota fasciola</i>
	Herre's pygmy goby	<i>Eviota herrei</i>
	Infulata pygmy goby	<i>Eviota infulata</i>
	Lachdebrere's pygmy goby	<i>Eviota lachdeberei</i>
	Melasma pygmy goby	<i>Eviota melasma</i>
	Nebulous pygmy goby	<i>Eviota nebulosa</i>
	Green bubble goby	<i>Eviota prasina</i>
	Pepperfin pygmy goby	<i>Eviota punctulata</i>
	Queensland pygmy goby	<i>Eviota queenslandica</i>
	Saipan pygmy goby	<i>Eviota saipanensis</i>
	Speckled pygmy goby	<i>Eviota sparsa</i>
	Storthynx pygmy goby	<i>Eviota storthynx</i>
	Zoned pygmy goby	<i>Eviota zonura</i>
	Mud reef-goby	<i>Eviota belissimus</i>
	Common fusegoby	<i>Fusigobius neophytes</i>
	Gladiator goby	<i>Gladigobius ensifer</i>
	Eyebar goby	<i>Gnatholepis cauerensis</i>
	Whitelined coral goby	<i>Gobiodon albofasciatus</i>
	Lemon coral goby	<i>Gobiodon citrinus</i>
	Yellow coral goby	<i>Gobiodon okinawae</i>
	Five-lined coral goby	<i>Gobiodon quinquestrigatus</i>
	Rippled coral goby	<i>Gobiodon rivulatus</i>
	Bravo's bearded goby	<i>Gobiopsis bravoii</i>
	Ornate goby	<i>Istigobius ornatus</i>
	Largetooth goby	<i>Macrodontogobius wilburi</i>
	Blackfin coral goby	<i>Paragobiodon lacunicolus</i>
	Black coral goby	<i>Paragobiodon melanosomus</i>
	Common mudskipper	<i>Periophthalmus kalolo</i>
	Barred mudskipper	<i>Periophthalmus argentilineatus</i>
	Bilobed ghost goby	<i>Pleurosicya bilobatus</i>
	Ghost goby	<i>Priolepis semidoliata</i>
	Half-barred goby	<i>Priolepis semidoliata</i>
	Tevega cave goby; Blue-striped cave goby	<i>Trimma tevegae</i>
	Tevega cave goby; Blue-striped cave goby	<i>Trimma tevegae</i>
	Flatfishes(flounders;soles)	<i>Pleuronectiformes</i>
	Lefteye flounders	<i>Bothidae</i>
Rrai	Peacock flounder	<i>Bothus mancus</i>
Rrai	Leopard flounder	<i>Bothus pantherinus</i>
	Soleidae	<i>Soles</i>
	Peacock sole	<i>Pardachirus pavoninus</i>
	Tunas; Mackerels	<i>Scomboidei</i>
	Snake Mackerels	<i>Gempylidae</i>
Telouchedui	Roudi escolar	<i>Promethichthys Prometheus</i>
	Cutlassfishes	<i>Trichiuridae</i>
Telouchedui		<i>Trichiurus lepturus</i>
	Tunas & Mackerels	<i>Scombridae</i>
Keskas or Mersad	Wahoo	<i>Acanthocybium solanderi</i>
Chesodm	Frigate tuna	<i>Auxis thazard</i>
Chesodm, Soda katsuo	Kawakawa	<i>Euthynnus affinis</i>

Mokorokor; Biturturch		<i>Grammatorcynus bicarinatus</i>
Biturturch	Double-lined mackerel	<i>Grammatorcynus bilineatus</i>
Kerengob	Dogtooth tuna	<i>Gymnosarda unicolor</i>
Katsuo, Mokorokor	Skip-jack tuna	<i>Katsuwonus pelamis</i>
Smaach	Indian mackerel	<i>Rastrelliger kannagurta</i>
	Striped mackerel; short mackerel	<i>Rastrelliger brachysoma</i>
Smaach	Chub mackerel	<i>Scomber japonicus</i>
Ngelngal	Narrow-barred king mackerel	<i>Scomberomus commerson</i>
Tekuu, Manguro	Yellow-fin Tuna	<i>Thunnus albacares</i>
	Billfishes	<i>Istiophoridae</i>
Meluis	Indo-Pacific sailfish	<i>Istiophorus platypterus</i>
Tekrar	Black Marlin	<i>Makaira indica</i>
	Broadbill swordfish	<i>Xiphiidae</i>
Meluis?		<i>Xiphias gladius</i>
	Helmet gurnards; Flatheads	<i>Scorpaeniformes</i>
Koklbetaot	Helmet Gurnards	<i>Dactylopteridae</i>
	Common helmet gurnard	<i>Dactyloptena orientalis</i>
	Flatheads	<i>Platycephalidae</i>
	Crocodile fish	<i>Cymbacephalus beauforti</i>
Debribr	Broadhead flathead	<i>Platycephalus arenicola</i>
Debribr	Fingelip flathead	<i>Platycephalus otaitensis</i>
	Coral Crouchers	<i>Caracanthidae</i>
	Spotted coral croucher	<i>Caracanthus maculatus</i>
	Pygmy coral croucher	<i>Caracanthus unipinna</i>
	Waspfishes	<i>Tetrarogidae</i>
	Mangrove waspfish	<i>Tetraroge barbata</i>
	Scorpionfishes	<i>Scorpaenidae</i>
	McAdam's scorpionfish	<i>Parascorpaena mcadamsi</i>
	Mozambique scorpionfish	<i>Parascorpaena mossambica</i>
Chesechid	Lionfish	<i>Pterois spp.</i>
	Yellowspotted scorpionfish	<i>Sebastapistes cyanostigma</i>
Koklobetaot		<i>Scorpaena spp.</i>
	Hairy scorpionfish	<i>Scorpaenodes hirsutus</i>
	Kellog's scorpionfish	<i>Scorpaenodes kelloggi</i>
	Coral scorpionfish	<i>Scorpaenodes parvipinnis</i>
	Blotchin scorpionfish	<i>Scorpaenodes varipinis</i>
	Guam scorpionfish	<i>Scorpaenodes guamensis</i>
Koklbetaot	Devil scorpionfish	<i>Scorpaenopsis diabolus</i>
Koklbetaot	Flasher scorpionfish	<i>Scorpaenopsis macrochir</i>
Koklbetaot	Pigmy scorpionfish	<i>Scorpaenopsis fowleri</i>

Koklbetaot	Tassled scorpionfish	<i>Scorpaenopsis oxycephala</i>
Koklbetaot	Spiny crown scorpionfish	<i>Scorpaenopsis sp.</i>
	Weedy scorpionfish	<i>Rhinopias frondosa</i>
Smuuch or Louch	Stonefish	<i>Synanceia verrucosa</i>
	Spiny devilfish	<i>Inimicus didactylus</i>
Louch	Leaf fish	<i>Taenianotus triacanthus</i>
	Ocellated lionfish	<i>Dendrochirus biocellatus</i>
	Zebra lionfish	<i>Dendrochirus zebra</i>
	Spotfin lionfish	<i>Pterois antennata</i>
	Clearfin lionfish	<i>Pterois radiata</i>
	Lionfish; Turkeyfish	<i>Pterois volitans</i>
	Catfishes	<i>Siluriformes</i>
	Eel catfishes	<i>Plotosidae</i>
	Striped eel catfish	<i>Plotosus lineatus</i>
	Trumpetfishes; cornetfishes	<i>Syngnathiformes</i>
	Trumpetfishesumpetfishes	<i>Aulostomidae</i>
	Trumpet fishes	<i>Aulostomus chinensis</i>
	Cornetfishes	<i>Fistularidae</i>
	Cornetfish; Smooth flutemouth	<i>Fistularia commersonii</i>
Ulach or Ulachmerand		<i>Fistularia petimba</i>
	Shrimpfishes	<i>Centriscidae</i>
	Shrimpfishes	<i>Aeoliscus strigatus</i>
	Pipefishes & Seahorses	<i>Syngnathidae</i>
	Yellow seahorse	<i>Hippocampus kuda</i>
	Naked pipefish	<i>Bhanotia nuda</i>
	Pugheaded pipefish	<i>Bulbonaricus brauni</i>
	Shortbodied pipefish	<i>Choeroichthys brachysoma</i>
	Sculpted pipefish	<i>Choeroichthys sculptus</i>
	Network pipefish	<i>Choeroichthys flavofasciatus</i>
	Pipefish	<i>Corythochthys haematopterus</i>
	Scribbled pipefish	<i>Corythochthys intestinalis</i>
	Black-breasted pipefish	<i>Corythochthys nigripectus</i>
	Ocellated pipefish	<i>Corythochthys ocellatus</i>
	Many-spotted pipefish	<i>Corythochthys polynotatus</i>
	Guiled pipefish; Schultz' pipefish	<i>Corythochthys schultzi</i>
	Bluestrip pipefish	<i>Doryhamphus excisus excisus</i>

	Jan's pipefish	<i>Doryrhamphus janssi</i>
	Negros pipefish	<i>Doryrhamphus negrosensis negrosensis</i>
	Banded pipefish	<i>Doryrhamphus (Dunkerocampus) dactyliophorus</i>
	Duncker's pipefish	<i>Halicampus dunckeri</i>
	Glittering pipefish	<i>Halicampus nitidus</i>
	Anderson's short-nosed pipefish	<i>Micrognathus andersonii</i>
	Pygmy short-nosed pipefish	<i>Micrognathus brevirostris pygmaeus</i>
		<i>Phoxocampus diacanthus</i>
		<i>Syngnathoides biaculeatus</i>
	Triggerfishes; Filefishes; Trunkfishes; Puffers; Porcupine fishes	Tetraodontiformes
	Triggerfishes	Balistidae
	Starry triggerfish	<i>Abalistes stellans</i>
Ilambrokl	Orangestriped triggerfish	<i>Balistapus undulates</i>
	Clown triggerfish	<i>Ballistoides conspicillum</i>
Tetachruchel, tangibtall		<i>Balistoides niger</i>
Beab	Mustache triggerfish; Titan triggerfish	<i>Balistoides viridescens</i>
	Spotted oceanic triggerfish	<i>Canthidermis maculates</i>
	Pinktail triggerfish	<i>Melichthys vidua</i>
	Redtooth triggerfish	<i>Odonus niger</i>
Cherakl, Dukl	Yellowmargin triggerfish	<i>Pseudobalistes flavimarginatus</i>
	Blue triggerfish; Rippled triggerfish	<i>Pseudobalistes fuscus</i>
Tungch	Picassofish; Humuhumu	<i>Rhinecanthus rectangulus</i>
Tungch	Wedge picassofish; Humuhumu	<i>Rhinecanthus rectangulus</i>
Tungch	Blackbelly picassofish	<i>Rhinecanthus verrucosus</i>
Tungch	Scythe triggerfish; Boomerang triggerfish	<i>Sufflamen bursa</i>
	Halfmoon triggerfish	<i>Sufflamen chrysoptera</i>
	Bridle triggerfish	<i>Sufflamen freanatus</i>
Tungch	Picasso triggerfish	<i>Sufflamen niger</i>
	Bluechin triggerfish (male); Guided triggerfish	<i>Xanthichthys auromarginatus</i>
	Filefishes	Monacanthidae
	Seagrass filefish	<i>Acreichthys tomentosus</i>
Lung	Scribbled filefish	<i>Aluterus scriptus</i>
	Broom filefish	<i>Amanses scopes</i>
	Barred filefish	<i>Cantherhines dumerilii</i>
Yalk	Wire-net filefish	<i>Cantherhines pardalis</i>

Moichall	Longnose filefish	<i>Oxymonacanthus longirostris</i>
	Blacksaddle mimic	<i>Paraluteres prionurus</i>
	Blackbar filefish	<i>Pervagor janthinosoma</i>
	Blackheaded filefish	<i>Pervagor nigrolineatus</i>
	Trunkfishes	<i>Ostraciidae</i>
Karamasus		<i>Lactoria cornutas</i>
Bebeu(sm); Riamel(Ig)	Cube trunkfish	<i>Ostracion cubicus</i>
	Spotted trunkfish	<i>Ostracion meleagris</i>
	Reticulate boxfish	<i>Ostracion solorensis</i>
	Smallnose boxfish	<i>Rhynchostracion nasus</i>
	Puffers	<i>Tetraodontidae</i>
	Whitespotted puffer	<i>Arothron hispidus</i>
	Narrow-lined puffer	<i>Arothron manilensis</i>
	Map puffer	<i>Arothron mappa</i>
	Guineafowl puffer	<i>Arothron meleagris</i>
Telbudel	Blackspotted puffer	<i>Arothron nigropunctatus</i>
Tiaueltelbudel	Star puffer	<i>Arothron stellatus</i>
	Ambon sharpnose puffer	<i>Canthigaster amboinensis (C. natalensis)</i>
	Bennet's sharpnose puffer	<i>Canthigaster bennetti</i>
	Fingerprint sharpnose puffer	<i>Canthigaster compressa</i>
	Crowned sharpnose puffer	<i>Canthigaster coronata</i>
		<i>Canthigaster epilampra</i>
		<i>Canthigaster janthinoptera</i>
	Spotted sharpnose puffer	<i>Canthigaster solandri</i>
	Valentinni's sharpnose puffer	<i>Canthigaster valentini</i>
	Porcupinefishes	<i>Diodontidae</i>
Drutm	Porcupinefish	<i>Diodon hystrix</i>
Drutm	Spiny balloonfish	<i>Diodon holacanthus</i>
	Shortspine porcupinefish	<i>Diodon liturosus</i>

Marine Invertebrates

Obtained from Matthews & Oiterong (1991) "The Role of Women in the Fisheries of Palau"

*** not in appropriate taxonomic order

Palauan	Common	Scientific
		Phylum Porifera (sponges)
<i>Rurout</i>		?
	NOTE: list of corals is found in a separate file.	Phylum Cnidaria (corals & jellyfishes)
<i>Bung</i>	Sea anemone	?
<i>Chetermall</i>	Sand colored sea anemone	Stoichactis japonicus
<i>Chetermall</i>		Stoichactis haddoni
<i>Olaunmeas</i>	Sea anemone	<i>Actinodendron plumosum</i>
<i>Chedeade</i>	Mastigias jellyfish	Mastigias sp.
<i>Chedeade</i>	Moon jellyfish	Aurelia sp.
		Phylum Sipincula (unsegmented marine worms)
<i>Chiull</i>		
<i>Ngimer</i>		
		Phylum Rhynchozoela (Nemertean)
		(Proboscis worms or ribbon worms)
?		?
		Phylum Annelida (segmented worms)
		Phylum Mollusca
		Class Bivalvia (clams & oysters)
<i>Chebau</i>	Lettered venus	Tapes literata
<i>Chedalngobel</i>	Yellow pitar venus	Pitar citrina
<i>Kerdaob</i>	Youthful venus sand clam	Periglypta puerpera
<i>Chesechol</i>	Nut clam	Actoodea striata
<i>Delbekai</i>	Nut clam	<i>Nucula rugosa</i>
	Nut clam	Gafrarium tumidum
<i>Chesechur</i>		Trachycardium flavum
<i>Rrudel</i>	Oyster	Pteria penguin
<i>Chesiuch</i>	Black lip pearl oyster	Pinctada margaritifera
<i>Iud</i>	Rock oyster	Ostrea glomerata
<i>Tiuach</i>	Black or Brown common hammer oyster	Malleus malleus
<i>Uteuetech</i>	Oyster	Chama buddiana
<i>Uteuetech</i>	Oyster	Chama sinuosa
<i>Delal a ngduul</i>		Anodonita alba
<i>Delal a ngduul</i>		Adonita philippina
<i>Ngduul</i>		Anodonita edulenta
<i>Eduib or Debuongel (found in Melekeok only?)</i>	Mangrove clam	Polymeseda luhuana
<i>Ilekum</i>	Interrupted lucina	Codakia interrupta

<i>Kdor (found in east. Bab. Only?)</i>		<i>Tellina virgata</i>
<i>Dekmus</i>	Donkey's ear abalone	<i>Haliotis asinina</i>
<i>Dekmus</i>	Sheep's ear abalone	<i>Haliotis ovina</i>
<i>Duadeb (Kim)</i>	Giant clam	<i>Hippoppus hippopus</i>
<i>Oruer</i>	Giant clam	<i>Tridacna crocea</i>
<i>Kism</i>	Giant clam	<i>Tridacna derasa</i>
<i>Otkang</i>	Giant clam	<i>Tridacna gigas</i>
<i>Melibes</i>	Giant clam	<i>Tridacna maxima</i>
<i>Ribkungel</i>	Giant clam	<i>Tridacna squamosa</i>
	Giant clam	<i>Tridacna sp.</i>
<i>Kim ra rechelid</i>		<i>Ostrea hyotis</i>
<i>Kim ra rechelid</i>		<i>Ostrea crista-galli</i>
<i>Olichel a sechou</i>	Pen shells	<i>Pinna spp.</i>
<i>Sebuis</i>	IndoPacific pen shell	<i>Atrina vexillum</i>
		<i>Nerita maxima</i>
<i>Delsangel</i>		<i>Nerita undata</i>
<i>Kikoi</i>	Ark shell	<i>Andara spp.</i>
<i>Kikoi</i>	Ark shell	<i>Barbatia reeveana</i>
<i>Buich</i>	Cowrie	<i>Cypraea tigris</i>
<i>Sang</i>	Spider shell	<i>Lambis lambis</i>
<i>Ototl</i>		<i>Conus spp.</i>
		Class Gastropoda (conches, limpets & nudibranchs)
<i>Kedarm</i>	Nautilus	<i>Nautilus belauensis</i>
<i>Bsungel</i>	Snails smaller than delsangel found in brackish mangrove water	<i>Terebralia semestriata</i>
<i>Buich</i>	Tiger cowrie	<i>Cypraea tigris</i>
<i>Debusech</i>	Trumpet triton	<i>Charonia tritonis</i>
<i>Delsangel</i>		<i>Nerita maxima</i>
<i>Delsangel</i>		<i>Nerita undata</i>
<i>Ibusech</i>	Giant murex	<i>Chicoreus ramosus</i>
<i>Itungel</i>	Snails smaller than delsangel found on rocks on beaches	?
<i>Murech</i>	Turreted nerite	<i>Neritina turrita cumingiana</i>
<i>Omuu</i>	Horned helmet	<i>Cassis cornuta</i>
<i>Ototel</i>	Cone shell	<i>Conus spp.</i>
<i>Rechil</i>	Sm. White conch	<i>Strombus gibberulus</i>
<i>Sang</i>	Spider shell	<i>Lambis lambis</i>
<i>Sang ra Roech</i>	Spider shell	<i>Lambis chiragra</i>
<i>Semachel</i>	Blood-mouthed conch	<i>Strombus luhuanus</i>
<i>Semal or Itol</i>	Sea hare	<i>Dolabella sp.</i>
<i>Sumum or Okeok</i>	Top shell snail	<i>Trochus niloticus</i>
		Class Cephalopoda (octopus & squids)

<i>Bukitang</i>	Octopus	<i>Polypus spp.</i>
<i>Luut</i>	Squid	<i>Loligo sp.</i>
<i>Milengoll</i>	Cuttlefish	<i>Sepia latimanus</i>
		<i>Class Polycophora (chitons)</i>
<i>Chechui</i>	Chiton	<i>Chiton tuberculatus ?</i>
<i>Chechui</i>	Chiton	<i>Acanthopleura sp. ?</i>
		Phylum Echinodermata (starfish, sea urchins, sea cucumbers)
		Class Stelleroidea
<i>Btuch ra doab</i>	starfish	Subclass Asteroidea (starfish)
<i>Btuch ra doab</i>	starfish	Subclass Ophiuroidea (brittle stars)
		Class Echinoidea (Sea urchins)
<i>Ibuchel</i>	Sea urchin	<i>Tripneustes gratilla</i>
<i>Ibuchel</i>	Sea urchin	<i>Hemicentrotus pulcherrimus</i>
<i>Ibuchel</i>	Sea urchin	<i>Strongylocentrotus pileolus</i>
<i>Choalech</i>	Sea urchin	<i>Diadema setosum</i>
<i>Duduomel</i>	Sea urchin	<i>Toxopneustes pileolus</i>
		Class Holothuroidea
<i>Cheremrum</i>	Sea Cucumber	<i>Actinopyga miliaris</i>
<i>Cheremrum</i>	Sea Cucumber	<i>Actinopyga echinites</i>
<i>Meremarech</i>	Sea Cucumber	<i>Bohadschia argus</i>
<i>Choas</i>		<i>Holothuria atra</i>
<i>Sengill</i>		<i>Holothuria flavomaculata</i>
<i>Delal a Molech</i>	Sea Cucumber	<i>Holothuria fuscopunctata</i>
<i>Bakelungall</i>		<i>Holothuria nobilis</i>
<i>Molech</i>	Sea Cucumber	<i>Holothuria scabra</i>
<i>Irimd</i>	Sea Cucumber	<i>Holothuria sp.</i>
<i>Sekesakel (or Teketekoel in Ngerchelong)</i>	Sea Cucumber	<i>Holothuria verrucosa</i> or <i>H. impatiens?</i>
<i>Chederngor</i>		<i>Holothuria difficilis</i>
<i>Ngimes</i>	Sea Cucumber	<i>Stichopus variegatus</i>
<i>Temtamel</i>	Beche de mer	<i>Thelenota ananas</i>
		Class Crinoidea (sea lilies)
		Phylum Arthropoda (crabs & shrimps)
		Class Crustacea
	Barnacles	
	Copepods	
<i>Chelauesachel</i>	Mantis shrimp	?
<i>Cheleched</i>		<i>Thalamitoides tridens</i>
<i>Cheleched</i>		<i>Thalamitoides spinimana</i>
<i>Cheleched</i>		<i>Thalamitoides danae</i>
<i>Chemang</i>		<i>Scylla serrata</i>
<i>Cherabrukl</i>	Spiny lobsters & crayfish	<i>Panulirus spp.</i>
<i>Raiklius</i>		<i>Panulirus penicillatus</i>
<i>Bleached</i>		<i>Panulirus versicolor</i>
<i>Melech</i>		<i>Panulirus longipes</i>

<i>Cheramrou</i>	Crayfish	<i>Laemedia astacina</i>
<i>Cheramrou</i>		<i>Thalassina anomala</i>
<i>Cherechur</i>	Shrimp	?
<i>Chesechuul</i>	Sand crab	?
<i>Kidl</i>	Red spot rock crab	<i>Carpiliuss maculatus</i>
<i>Kmai</i>	Blue spot rock crab	<i>Portunus pelagicus</i>
<i>Ksull</i>		<i>Paraxanthia elegans</i> (or)
<i>Ksull</i>		<i>Xanthias lividus</i>
<i>Ksull</i>		<i>Atergatopsis signatus</i>
<i>Rekung, rekung el beab, o r rekung kakum</i>		<i>Cardisoma hirtipes</i>
<i>Rekung el daob</i>		<i>Cardisoma carnifex</i>
<i>Rereek</i>	Black rock crab	<i>Grapsus tenuicrustatus</i>
<i>Senges</i>	Gray crab w/ square body	<i>Neopisesarma lafondi</i>

Hard Corals of Palau

Obtained from Richard Randal's Reef Building Corals in the Marianas and Palau... (1995) of 385 hard coral species collected (so may not include all coral species in Palau)

Palauan	Common	Scientific	Biological Status (Endemic, Native Introduced, etc.)
<i>Merand - all corals</i>		Order SCLERACTINIA	
<i>Badelchei - Porites</i>		ASTROCOENIIDAE (2 spp.)	
<i>Sond - branching coral</i>		<i>Stylocoeniella</i>	
		THAMNASTERIIDAE (12 spp)	
		Psammocora	
		POCILLOPORIDAE (19 spp.)	
		Seriatopora	
		Stylophora	
		Palauastrea	
		Pocillopora	
		Madracis	
		ACROPORIDAE (127 spp.)	
		Acropora	
		Anacropora	
		Astreopora	
		Montipora	
		AGARICIIDAE (31 spp.)	
		Pavona	

	<i>Gardineroseris</i>	
	<i>Coeleseris</i>	
	<i>Leptoseris</i>	
	<i>Pachyseris</i>	
	SIDERASTREIDAE (2 spp.)	
	<i>Coscinaraea</i>	
	FUNGIIDAE (28 spp.)	
	<i>Cycloseris</i>	
	<i>Diaseris</i>	
	<i>Fungia</i>	
	<i>Heliofungia</i>	
	<i>Ctenactis</i>	
	<i>Herpolitha</i>	
	<i>Polyphyllia</i>	
	<i>Sandalolitha</i>	
	<i>Lithophyllon</i>	
	<i>Podabacia</i>	
	PORITIDAE (44)	
	<i>Porites</i>	
	<i>Stylaraea</i>	
	<i>Goniopora</i>	
	<i>Gonipora</i>	
	<i>Alveopora</i>	
	FAVIIDAE (60)	
	<i>Caulastrea</i>	
	<i>Barabattoia</i>	
	<i>Favia</i>	
	<i>Favites</i>	
	<i>Goniastrea</i>	
	<i>Leptoria</i>	
	<i>Platygyra</i>	
	<i>Oulophyllia</i>	
	<i>Montastrea</i>	
	<i>Plesiastera</i>	
	<i>Diploastrea</i>	
	<i>Leptastrea</i>	
	<i>Cyphastrea</i>	
	<i>Echinopora</i>	
	OCULINIDAE (3)	
	<i>Galaxea</i>	
	<i>Acrhelia</i>	
	MERULINIDAE (8)	
	<i>Hydnophora</i>	
	<i>Merulina</i>	
	<i>Scapophyllia</i>	
	<i>Paraclavarina</i>	

	MUSSIDAE (14)	
	<i>Scolymia</i>	
	<i>Acanthastrea</i>	
	<i>Lobophyllia</i>	
	<i>Symphyllia</i>	
	PECTINIIDAE (10)	
	<i>Echinophyllia</i>	
	<i>Mycedium</i>	
	<i>Pectinia</i>	
	<i>Oxypora</i>	
	CARYOPHYLLIIDAE (7)	
	<i>Euphyllia</i>	
	<i>Plerogyra</i>	
	<i>Physogyra</i>	
	DENDROPHYLLIIDAE(6)	
	Turbinaria	
	Order COENOTHECALIA	
	HELIOPORIDAE (1)	
	Helipora	
	Order Stolonifera	
	TUBIPORIDAE (1)	
	Tubipora	
	Order MILLEPORINA	
	MILLEPORIDAE (10)	
	Millepora	

Appendix B. Stone features recorded in 2010 survey.

Ulong Group: Ulong Island		
Feature number	Type	Description
F-1	well	4m x 1.5m, E-W aligned. The well is walled by medium to large coralline limestone blocks. The integrity of the walls has been heavily impacted by vegetation growth, particularly on the north side. The well was excavated by Osborne (1979) and is now partially infilled with sand plain sediments.
F-2	platform	11m x 4.5m, E-W aligned, badly preserved platform. The platform is constructed of medium sized coralline limestone blocks and has irregular edges.
F-3	platform	12m x 7m, E-W aligned badly preserved platform. The platform is constructed of medium sized coralline limestone blocks, the edges are irregular preserved.
F-4	standing stones	A concentration of four standing stones deeply buried in beach sediments. The stones are situated in a rectangular, 0.7m apart from one another. Average height of the stones above ground is 0.5m.
F-5	walls	80m x 3.5m, N-S aligned defensive wall. Detailed description in text.
F-6	coral head	1.5m in diameter. Deeply buried in midden deposit, 3m behind the large wall.
F-7	terrace	18m x 6m, terrace at the back of the large cove on the beach-flat. Low (0.3m) walled feature on the west edge. The front wall is roughly NW-SE aligned, terrace is constructed from mainly small coralline limestone blocks.
F-8	terrace	9m x 7.5m. Terrace on top of cliff line. The walled edge on the SE side is irregular shaped and is roughly NE-SW aligned.
F-9	terrace	14m x 8m. Terrace on slope, wall edge is located on west side (approximately 0.6m height) and is constructed from medium to large coralline limestone blocks.
F-10	terrace	21m x 6.5m, N-S aligned terrace. Walled terrace edge is observed on the west and south side (approximate height 0.4m). The terrace is constructed from medium sized coralline limestone blocks and has in the south quarter a gap, which may be an intentional step. The path upslope leads through this gap.
F-11	terrace	34m x 4m, E-W aligned terrace. This terrace is the lowest feature in the complex of three terraces (with F-12 and F-13). The walled edge is located on the north and west side of the terrace and is constructed from medium sized coralline limestone blocks.
F-12	terrace	34m x 17m, E-W aligned terrace. This terrace is the second feature in a complex of three terraces (with F-11 and F-13). It is situated just above F-11. The walled edge is located at the north and west side of the terrace and is constructed from medium sized coralline limestone blocks.
F-13	terrace	7.5m x 16m, N-S aligned terrace. This terrace is the eastern extension of a complex of three terraces (with F-11 and F-12). It is situated above F-12. The walled edge is located at the north and west side of the terrace and is constructed from medium sized coralline limestone blocks.
F-14	platform	7m x 2m, NW-SE aligned terrace on the north-eastern slope of a large sink hole. It is situated against a low outcrop of coral limestone to the east. The walled edge on the west side is well-preserved with a height of up to 1.5m.
F-15	terrace	12m x 8m, NW-SE aligned terrace on the eastern slope of a large sink hole. The terrace is well-preserved. The western wall edge is in parts up to 1m high.
F-16	terrace	6m x 2.5m, N-S aligned triangular terrace on the eastern slope of a large sink hole. The terrace wall is on the western side of the feature and is approximately

		0.4m high.
F-17	terrace	20m x 6m, E-W aligned terrace. The walled edge is located on the southern side of the terrace (approximately 0.2m high). The terrace is the lowest feature in a complex of terraces (with F-18 and F-19) in a recess to the north of the main village area.
F-18	terrace	15.5m x 9m, E-W aligned terrace. The wall edge is slightly curved and is the back wall of terrace F-17. The height of the wall is approximately 0.5m. This terrace is the central part of a terrace complex (with F-17 and F-19) in a recess to the north of the main village area.
F-19	terrace	6.5m x 13m, E-W aligned terrace above F-18. This terrace has a built up wall to the south and in the southwest part. Wall edges are the back walls of F-18. The wall height is approximately 0.6m.
Burial cave	cave	This cave is located at the back of the recess just above F-19. It has a 5m wide opening and a depth of 7.5m. The cave contains a fine, white aeolian sediment. Some pottery fragments and food shell remains were observed on the surface. Some fragmented bones, possibly human, were observed.
Ngemelis Group: Dmasech Island		
Feature number	Type	Description
F-1A	platform	18.5m x 9.5m, NE-SW aligned L-shaped platform constructed of medium to large coralline blocks. The platform is well preserved, the average height is approximately 0.5m above ground surface. Several shell tools were observed on top of the platform.
F-2A	platform	12.5m x 3.5m, E-W aligned, badly preserved platform. Only the outline of the platform, made from small to medium coralline limestone blocks is preserved.
F-3A	platform	7.5m x 7.5m rectangular, badly preserved platform. Only the outline of the platform, made from small to medium coralline limestone blocks is preserved.
F-4A	platform	7m x 4.5m E-W aligned, badly preserved platform. Only the outline of the platform, made from small to medium coralline limestone blocks is preserved.
F-5A	platform	36m x 7m, NW-SE aligned, well-preserved platform constructed from small to medium sized coralline blocks. Detailed description in text.
F-6A	platform	7m x 3m, NW-SE aligned, badly preserved platform. Only the outline of the platform, made from small to medium coralline limestone blocks is preserved.
F-7A	platform	9m x 7m, E-W aligned, badly preserved platform. Only the outline of the platform, made from small to medium coralline limestone blocks is preserved. A large volcanic rock was recorded in the SW corner of the platform.
F-8A	platform	14m x 11m, irregular, badly preserved platform. Only the outline of the platform, made from small to medium sized coralline limestone blocks is preserved.
F-2	platform	Two interconnected platforms, with maximum dimensions of 14m x 19m, NW-SE aligned. The east platform is approximately 40-50cm high, the west platform 30-40cm high, and they are connected by a low level of limestone cobbles. Both platforms are constructed from rounded cobbles of coralline limestone with larger blocks on the outside of the level area.
F-3	platform	15m x 7m, E-W aligned, moderately preserved platform constructed from small to medium sized coralline blocks.
F-4	sink hole/well	10.5m x 6.5m, NW-SE aligned sink hole. The sink hole is modified by walled stone features. Detailed description in text.
F-5	platform?	11m x 11m, NW-SE aligned, rectangular area which has been cleared of most surface stones.

F-6	dock?	13.5m x 8m, NW-SE aligned platform of small to medium sized coralline limestone blocks, heavily impacted by vegetation growth. The platform is located in front of the limestone ridge in the intertidal zone, the edges of the platform are irregular. This feature is interpreted as a landing dock for canoes, but may be a breakwater behind which canoes could be sheltered.
F-7	terrace?	9m x 7m, irregular shaped mound of coralline limestone blocks. This feature is too irregular to be described as a platform and might be a terrace.
F-8	platform	5.5m x 8.5m, NW-SE aligned nearly rectangular platform. The platform is heavily impacted by vegetation growth and possibly also by human activity. A mound of coralline limestone blocks was observed in the NE corner.
F-9	mound	16m x 0.8m, semi-circular mound, NW-SE aligned. The function of this mound is unclear. Masse et al. (1982) suggested it was a Japanese fortification, however, the lack of Japanese artifacts on the surface could indicate an older age.
F-10	irregular	4m x 3.5m, irregular shaped mound of small to medium sized coralline limestone blocks.
F-11	platform?	6.5m x 5.5m, NW-SE aligned, rectangular area which has been cleared of most surface stones.
F-12	wall?	10.5m x 2m, NW-SE aligned wall feature constructed from medium sized coralline limestone blocks. Masse et al. (1982) interpreted this feature as a partly destroyed platform. However, the alignment and shape of the feature could also represent a wall, enhancing the defensive aspect of the limestone ridge.
F-13	mounds	9m x 10m, series of small mounds of mostly small coralline limestone blocks with an irregular shape. This area could be a burial site. Subsurface testing is necessary to determine the features purpose.
F-14	irregular	9.5m x 1.5m, irregular shaped mound of coralline limestone blocks. The function of this mound is unclear, but the location suggests a similar function as F13. Subsurface testing of the feature is necessary to identify the purpose of the feature.
F-15	wall	16m x 2m, semi-circular wall constructed from medium-sized coralline limestone blocks. Detailed description in text.
F-16	platform	11m x 6m, NW-SE aligned low mound of coralline limestone rubble. The edges of the platform are irregular, most likely heavily impacted by vegetation.
F-17	ramp	8m x 5m, SW-NE aligned gap in ridge-line. This feature could be interpreted as a landing point. Dense midden deposits of pottery fragments, shell artifacts and food shells are on the surface.
F-18	platform	30m x 16m, NW-SE aligned irregular platform constructed of medium sized coralline limestone blocks and volcanic rocks. Detailed description in text.
F-19	platform	4m x 3.5m, SW-NE aligned rectangular platform constructed mainly from small coralline limestone blocks. Central height is about 0.3m. The platform is associated with F-20 and F-21, situated on a raised limestone ridge encircled by a network of intertidal channels.
F-20	platform	9m x 5.5m, N-S aligned rectangular platform constructed mainly from small coralline limestone blocks. Central height is approximately 0.4m above surface. The platform is located in close proximity to F-19.
F-21	platform	7m x 4m, N-S aligned rectangular platform constructed mainly from small coralline limestone blocks. Central height is approximately 0.4m above surrounding surface. The platform is located in close proximity to F-19.
F-22	ramp	20m x 9m N-S aligned, large gap in limestone ridge. Surface close to the mangrove swamp to the north is densely covered with pottery fragments, shell

		tools and food shell remains. This feature is interpreted as a possible landing area.
F-23	wall	14m x 6m N-S aligned walled feature of medium sized coralline limestone blocks. The walled feature artificially narrows a natural intertidal channel. The surface surrounding the feature is densely covered with pottery fragments and food shell remains.
F-24	wall	44m x 22m. Large system of well-preserved wall features to the south of platforms F19-F21. The features are constructed from medium sized coralline limestone blocks with an artificial gap directly south of the F-22 (possible entrance). The areas behind the walls are filled with small coralline limestone blocks to level the surface.
F-25	wall	12.5m x 1m, NW-SE aligned wall constructed from small to medium sized coralline limestone blocks on the north side of an intertidal channel.
F-26	ramp	8.5m x 5m, N-S aligned gap in limestone ridge line. Surface is covered with pottery fragments and food shell remains. This feature may be a landing point.
Ngemelis Group: Uchularois Island		
Feature number	Type	Description
F-1	platform	11m x 7m, N-S aligned platform constructed from small to medium sized coralline blocks. Detailed description in text.
F-2	platform	6m x 5m, N-S aligned platform, mostly destroyed
F-3	platform	6m x 4m, N-S aligned platform, mostly destroyed
F-4	terrace	8m x 4m, NW-SE aligned terrace constructed from medium sized coralline limestone blocks. Inner area filled with small-sized rocks, walled edge on south side.
F-5	terrace	6m x 5m, NW-SE aligned terrace constructed from medium sized coralline limestone blocks. Inner area filled with small sized rocks with a walled edge on the south side.
F-6	terrace	5m x 3m, NW-SE aligned terrace constructed from medium sized coralline limestone blocks. Inner area is filled with small sized rocks with a walled edge on the south side.
F-7	dock	33m x 4m, SW-NE aligned coralline limestone canoe dock constructed from medium-sized to large blocks, only remnants of the original height, around 80-100cm of the structure remain.
F-8	wall	8m x 0.8m, NE-SW wall, destroyed
F-13	terrace	16.5m x 6m, E-W aligned terrace. The terrace edge is not well preserved, south wall may be modified. Several pottery fragments and food shells were found on the surface and on the slopes north and south of the feature.
F-14	terrace	5.5m x 2.5m, NE-SW aligned irregular terrace constructed from medium sized coralline limestone blocks. Only the south edge is well preserved.
Ngeruktabel Island: Little Mariar and Big Mariar		
Feature number	Type	Description
F-1	platform	13m x 6.5m N-S aligned platform on beach-flat. The feature is badly preserved, the edges are irregular, only the seaward edge can be identified.
F-3	wall	110m x 2m SW-NE aligned wall constructed from medium sized to large coralline limestone blocks. Detailed description in text.
F-4	terrace	11m x 18m, NE aligned terrace on SW slope. Well preserved approximately 1.8m high wall on NE edge constructed from small to large coralline limestone blocks.

F-5	terrace	19m x 13.5m, E-W aligned terrace on SW slope. Well preserved approximately 1.6m high wall on E edge constructed from small to large coralline limestone blocks. Masse et al. (1982) recorded three pairs of 0.75m large flat topped stones on the level area.
F-6A	terrace	7m x 2m, SW-NE aligned terrace on northern side of sink. Walled edge Moderately preserved, 0.8m high.
F-6B	irregular	3.5m x 2m, E-W aligned platform on northern edge of sink. Only the outline of the platform remains.
F-7	platform	17m x 8.5m, SW-NE aligned platform on hill top directly south of the large Mariar cove. A retaining wall extends to the northeast side of the platform building the edge of a terrace feature. Three imported stone were found, one upright slab of aragonite/calcite (0.36cm height) is embedded in the platform and two volcanic rocks on the surface next to the platform were reported by Masse et al. (1982).
F-8	terrace	7m x 12m, E-W aligned terrace in terrace complex containing F-8, F-9 and F-10. Moderately preserved wall edge on north and west side.
F-9	terrace	17.5m x 9.5m, E-W aligned terrace in terrace complex containing F-8, F-9 and F-10. Moderately preserved wall edge on northern side is simultaneously retaining wall for F-8.
F-10	terrace	16m x 8m, N-S aligned terrace in terrace complex containing F-8, F-9 and F-10. Wall edge mainly on west side along the uphill path.
F-11	stone circle	6m in diameter. The feature consists of 12 large coralline limestone blocks set into a circle, evenly spaced from each other.
F-12	terrace	7.5m x 3m, E-W aligned terrace with walled section at northern part. Constructed from medium sized coralline limestone blocks.
F-13	terrace	8m x 3.5m, E-W aligned, semicircular terrace following slope. The walled part is on the north edge, constructed from medium sized coralline limestone blocks.
F-14	terrace	6.5m x 6.5m, N-S aligned terrace. The terrace has two sections: the upper section is located approximately 0.75m above the lower section. A small depression can be observed in the lower section.
F-25	terrace	12m x 2m, E-W aligned terrace on north slope. The wall edge is on the west and south side, approximately 0.5m high.
F-26	wall	15m x 2m, SW-NE aligned wall with gap for pathway situated in the middle section of the wall. The wall is well preserved constructed from medium sized coralline limestone blocks (approximate height 0.75-1.0m).
F-27	wall	27m x 9m, NW-SE aligned wall with gap for pathway located in the southern third of the wall. According to Masse et al. (1982) this wall is the lowest section of a wall complex on the low saddle connecting Big and Little Mariar coves. A large sink hole is located to the north of this feature. The south wall is the largest feature in this complex with nearly vertical outer (southern) appearance. The height is 2m. Several unexploded WWII bombs were detected in the general area.
F-28	terrace	12m x 4m, NW-SE aligned terrace on northeast slope. The wall edge is preserved up to 0.75-1.0 m and is located to the northeast of the terrace.
F-30	terrace	11m x 11m E-W aligned triangular terrace on western slope. Walled edges to the north and south, the northern slope overlooks large sink.
F-31	terrace	36m x 10m NW-SE aligned terrace on south slope. The terraces was previously recorded as separate to F-36, however both features are connected. The walled edge is located to the south and west of the terrace.
F-33	platform	29m x 28m large platform complex on hill top between Little and Big Mariar coves. Detailed description in text.
F-36	terrace	36m x 10m NW-SE aligned terrace on south slope. The terraces was previously recorded as separate to F36, however both features are connected. The wall edge is located to the south and west of the terrace.
F-37	terrace	17.5m x 9.5m, SW-NE aligned terrace on east slope. Wall edges on SE and SW side.
F-38	terrace	12m x 14m, NW-SE aligned terrace on north slope. Wall edges on NE and NW side.

F-39	terrace	7m x 4.5m, E-W aligned triangular terrace on west slope. Wall edges to the north and south, the north slope overlooks a large sink hole.
D	terrace	14.5m x 14m, SW-NE aligned terrace on north slope. Badly preserved irregular edges on north side of terrace
E	terrace	21m x 21m, badly preserved terrace on north slope. Feature edges are unclear.
F	terrace	26m x 5m, badly preserved terrace on west slope. Wall edge follows cliff face on west side.
Ngeruktabel Island: Ngeremdiu		
Feature number	Type	Description
F-1	platform	24m x 15m, NW-SE aligned platform on hill top. The northern parts of the platform walls are well preserved with a height of up to 1.5m. The south side has a walled 'bulge' to the west, which follows the natural cliff line.
F-2	wall	9m x 4m, SW-NE aligned platform in limestone recess. The wall is badly preserved, the east side may have been heavily damaged by tree fall.
F-3	stone money	0.8m in diameter, N-S aligned. Unfinished Yapese stone money made from calcite, detailed description in text.
F-4	wall	12.5m x 5m N-S aligned large defensive wall blocking entrance to recess to the east. The wall is constructed of medium sized, rounded coralline limestone blocks and is well preserved (average height approximately 1.3m).
F-5	terrace	11m x 14.5m, SW-NE aligned terrace. The south edge of the feature is irregular shaped following the cliff line. The north and east edge are regular and constructed from small coralline limestone blocks.
F-6	wall	20m x 5.5m, E-W aligned wall constructed from small to medium sized rounded coralline limestone blocks. The wall is situated on a saddle and blocks access between the large beach and the cove to north. Intentional steps are constructed and a path leads through the east section of the wall.
Oimaderuul	well	2.5m in diameter. Recently refurbished stone-lined well, detailed description in text.
F-9	wall	33m x 1.5m, E-W aligned wall constructed from medium sized rounded coralline limestone blocks. The wall is not well preserved and only stacked blocks to a height of 0.5m remain.
F-10	platform	16m x 3.5m, E-W aligned platform on beach flat. The platform is constructed from small to medium sized rounded coralline limestone blocks. Moderately preserved platform with an average height of 0.5m.
F-28	platform	18m x 15.5m terrace feature on hill top with a central 9.5m x 7m N-S aligned platform. The complex is not very well preserved, there are Japanese defenses to the NW (gun-position) and to the south (cave). The whole ridge line has been heavily shelled during WWII.
F-37	terrace	23m x 7m in maximum dimensions. Semicircular terrace at the base of the ridgeline. Walled edge on the south side is irregular and only 0.3m high constructed from small coralline limestone blocks.
F-38	terrace	39m x 7m in maximum dimensions. Semicircular terrace at the base of the ridgeline. Walled edge on the southeast side is irregular and follows the ridge line in the direction of a large sink to the northeast. South section of the wall edge is only 0.3m high and is constructed from small coralline limestone blocks, the north part is up to 1.0m high.
F-100	terrace	7m x 9.5m N-S aligned terrace on southern slope. Southern and eastern edge of terrace walled, constructed from small to medium-size coralline limestone blocks. Average height of terrace above surrounding ground is 0.3m.
F-102	terrace	15m x 8.5m terrace with a 5.5m x 4m E-W aligned rectangular platform. The terrace has a walled edge on the south and west side with an average height of 0.2m. The platform is constructed from mainly small with some medium sized coralline limestone blocks and has an average height of 0.3m. Both terrace and platform are badly preserved.
F-105	terrace	15.5m x 15m terrace on southeast slope. The walled edge is on the southeast side of the terrace and follows the ridge line. The wall edge is well preserved with an average height of 1.5m and it is constructed from medium sized

		coralline limestone blocks.
F-106	platform	15m x 10m E-W aligned platform in a sink hole. The platform is covered with pottery fragments and food shell remains. On the west side of the sink is a small niche in the cliff face. The platform is constructed from medium sized coralline limestone blocks.
F-107	wall	15m x 5m E-W aligned wall on the north side of a small saddle overlooking the marine lake.
F-108	terrace	12m x 8m in maximum size. The terrace is NW-SE aligned and is located on a narrow saddle to the east of F-107.
F-109	platform	11.5m x 10m E-W aligned platform on saddle. The platform is badly preserved, the edges are irregular. It is constructed from small to medium sized blocks of coralline limestone with an average height of 0.2m above ground.
F-110	platform	8.5m x 5m E-W aligned platform. The platform is constructed from medium sized rounded coralline limestone blocks. In the northeast section a large hole can be observed which might have been a Japanese defensive position or be the result of tree fall.
Ngeanges Island: Ngeanges		
Feature number	Type	Description
F-1	terrace	11.5m x 5m, NW-SE aligned terrace on south slope, wall edge is on southwest side of the terrace. The terrace levels a gentle sloping area.
F-2	terrace	11.5m x 5m, NW-SE aligned terrace on southwest slope, wall edge is on southwest side of terrace. The terrace levels a gentle sloping area.
F-3	terrace	10.5m x 5m, NW-SE aligned terrace on southwest slope, wall edge is on south and west side of terrace. The terrace levels a gentle sloping area.
F-4	terrace	12.5m x 5.5m, SW-NE aligned terrace on northwest slope, wall edge is on northwest side of terrace. The terrace levels a gentle sloping area.
F-5	terrace	8m x 4m, SW-NE aligned terrace on west slope, wall edge is on south and west side of terrace. The terrace levels a gentle sloping area.
F-6	irregular	Three concentrations of coralline limestone blocks on hill top (4m, 15m, and 1m in diameter).
F-7	platform	20.5m x 8m, E-W aligned series of platforms or platform-like features. The preservation is generally bad and feature outlines are irregular. There are three levels of platforms: the west section has been cleared of large stones, the central area has also been cleared of all stones and a level area filled with small coralline limestone blocks has been constructed with a depth of up to 0.3m. The east section is substantially lower (up to 0.75m) and has been separated from the central section by a retaining wall.
F-8	terrace	12m x 5.5m N-S aligned terrace on east slope, wall edge is on the east side of the terrace. The terrace levels a gentle sloping area.
F-9	platform	14.5m x 12m, NW-SE aligned platform on hill top. Two parallel walls are the east and west boundaries of the platform. Masse et al. (1982) described a central N-S aligned raised platform in the central area which is most likely a WWII Japanese defensive position.
F-10	terrace	10m x 7m, NW-SE aligned terrace on southwest slope. The wall edges are to the south, west and east of the platform. The terrace levels a gentle sloping area.
F-11	platform	8.5m x 4.5m, NW-SE aligned platform. This platform might be bigger and has been recorded by Masse et al. (1982) as a larger platform with dimensions of 22m x 5m. The north part of the platform is slightly raised (0.7m) and was interpreted by Masse et al. (1982) as a cooking platform.
F-12	terrace	13m x 5m, SW-NE aligned triangular terrace on west slope. Wall edges on west side, the terrace levels a gentle sloping area.
F-13	platform	5m x 5m, square platform on hill top.
F-14	WW II	2.5m x 2m, Japanese defensive site (gun position).
F-15	terrace	6.5m x 4m, NW-SE aligned terrace on small saddle. The wall sides are badly preserved and only irregular edges remain.
F-16	terrace	12.5m x 5.5m, SW-NE aligned terrace on east slope. The wall edges are on the

		east side. The terrace levels a gentle sloping area.
F-17	terrace	9m x 11m, L-shaped platform on south slope. Directly adjacent to the north are four steps. Masse et al. (1982) interpret this complex as most likely WWII Japanese defenses.
F-18	stone money quarry	Two large cut-out features on the south edge of the hill top. These features cut into a natural calcite outcrop are tentatively interpreted as a Yapese stone money quarry.
F-19	platform	16m x 14m irregular shaped platform on hill top. The edges are badly preserved.
F-20	terrace	12m x 5m, E-W aligned triangular terrace on north slope. The wall edges are on the north side of the terrace. The terrace levels a gentle sloping area.
F-21	platform	6.5m x 4m, N-S aligned platform on the sand plain. The platform contains an outline of large coralline limestone blocks, the central area is lowered and no infill of smaller rocks was observed.

Appendix C. Radiocarbon dates from cultural sites in the Rock Islands.

Lab Number	Conventional radiocarbon age	Calibrated	Sample	Context
NZ-6291	2260 ± 40	BC33-84AD	Tridacna sp.	Mariar, OR-15:1, EU4, 60-70cm
NZ-6311	648 ± 35	AD1557-1655	Tridacna sp.	Mariar, OR-15:1, EU6, 40-50cm
DIC-2532	600 ± 40	AD1590-1696	Strombus sp.	Mariar, OR-15:1, F-7, EU8, 20-40cm
NZ-6254	1300 ± 35	AD1005-1107	Strombus sp.	Mariar, OR-15:1, EU4, 0-10cm
NZ-6290	1310 ± 40	AD991-1101	Strombus sp.	Mariar, OR-15:1, F-48, EU10, 10-20cm
NZ-6295	690 ± 35	AD1521-1624	Strombus sp.	Mariar, OR-15:1, F-48, EU10, 10-20cm
NZ-6296	871 ± 35	AD1395-1461	Strombus sp.	Mariar, OR-15:1, F-33, EU12, 10-20cm
Beta-?	1630 ± 40	AD548-632	Human bone	Chomedokl, OR-15:18, Sample 100
Beta-?	2140 ± 40	BC44-56AD	Human bone	Chomedokl, OR-15:18, Sample 101
Beta-?	1110 ± 40	AD1033-1125	Human bone	Chomedokel, OR-15:18, Sample 102
NZ-6312	923 ± 35	AD1343-1421	Strombus sp.	Ngeanges, OR-16:6 (OR:14), EU1, 10-20cm
NZ-6313	871 ± 35	AD1395-1461	Strombus sp.	Ngeanges, OR-16:6 (OR:14), EU1, 10-20cm
NZ-6345	774 ± 35	AD1454-1519	Strombus sp.	Ngeanges, OR-16:7 (OR:15), EU2, 0-10cm
NZ-6350	998 ± 36	AD1293-1358	Strombus sp.	Ngeanges, OR-16:7 (OR:15), EU2, 40-50cm
NZ-6320	1225 ± 40	AD1066-1179	Strombus sp.	Ngeanges, OR-16:7 (OR:15), EU1, 20-30cm
DIC-2531	550 ± 35	AD1657-1729	Strombus sp.	Ngeanges, OR-16:6 (OR:16), F-7, EU1, 10-20cm
ANU-11932	1070 ± 70	AD1200-1332	Tridacna sp.	Ulong, OR-15:5, TP1, 10-20cm
ANU-12096	1400 ± 60	AD889-1027	Hippopus sp.	Ulong, OR-15:5, TP1, 20-30cm
ANU-12097	660 ± 150	AD1217-1431	Charcoal	Ulong, OR-15:5, TP1, 20-30cm
WK-15645	582 ± 49	AD1309-1361	Charcoal	Ulong, OR-15:5, U4, 30-40cm
OZG-276	940 ± 50	AD1156-1260	Pot residue	Ulong, OR-15:5, U3, 50-60cm
ANU-11930	1790 ± 190	AD17-433	Charcoal	Ulong, OR-15:5, U3, 70-80cm
WK-13777	2260 ± 48	BC350-172	Pot residue	Ulong, OR-15:5, U4, 110cm
ANU-12107	2830 ± 70	BC785-589	Tridacna sp.	Ulong, OR-15:5, U1, 70-80cm
ANU-12108	2820 ± 80	BC781-563	Tridacna sp.	Ulong, OR-15:5, U1, 80-90cm
ANU-11933	2890 ± 110	BC894-597	Conus sp.	Ulong, OR-15:5, U3, 120-130cm
ANU-12114	2930 ± 70	BC891-744	Tridacna sp.	Ulong, OR-15:5, U4, 110-120cm
ANU-12113	2650 ± 130	BC976-743	Charcoal	Ulong, OR-15:5, U4, 110-120cm
OZG-342	2820 ± 40	BC1016-916	Charcoal	Ulong, OR-15:5, U3, 120-130cm
ANU-11768	2890 ± 50	BC829-720	Tridacna sp.	Ulong, OR-15:5, U3, 140-150cm
ANU-11769	2950 ± 50	BC879-774	Tridacna sp.	Ulong, OR-15:5, U3, 150-160cm
WK-15646	3094 ± 36	BC1040-909	Tridacna sp.	Ulong, OR-15:5, U4, 150-160cm
ANU-11767	2730 ± 60	BC666-475	Trochus sp.	Ulong, OR-15:5, U1, 150-160cm
OZG341	2450 ± 40	BC746-414	Charcoal	Ulong, OR-15:5, U3, 150-160cm
WK-14357	2471 ± 39	BC506-400	Pot residue	Ulong, OR-15:5, U4, 170-180cm
ANU-11931	2330 ± 180	BC522-47	Pot residue	Ulong, OR-15:5, U1, 150-160cm
OZG-274	2580 ± 40	BC752-550	Pot residue	Ulong, OR-15:5, U1, 150-160cm
ANU-11910	2450 ± 200	BC756-344	Pot residue	Ulong, OR-15:5, U1, 150-160cm
WK-15647	3358 ± 40	BC1396-1283	Hippopus sp.	Ulong, OR-15:5, U4, 200-210cm
ANU-11934	3100 ± 60	BC1082-910	Tridacna sp.	Ulong, OR-15:5, U3, 210-220cm
ANU-11766	3200 ± 50	BC1214-1040	Lambis sp.	Ulong, OR-15:5, U3, 210-220cm

ANU-12119	2330 ± 180	BC593-202	Charcoal	Ulong, OR-15:5, U5, 230-240cm
ANU-12115	3210 ± 80	BC1257-1021	Tridacna sp.	Ulong, OR-15:5, U4, 220-230cm
ANU-12116	3230 ± 60	BC1266-1073	Tridacna sp.	Ulong, OR-15:5, U4, 220-230cm
ANU-12118	3110 ± 60	BC1096-910	Tridacna sp.	Ulong, OR-15:5, U5, 230-240 cm
ANU-12120	3330 ± 80	BC1404-1196	Hippopus sp.	Ulong, OR-15:5, U5, 230-240 cm
ANU-12117	3550 ± 70	BC1632-1454	Cypraea sp.	Ulong, OR-15:5, U4, 260-270cm
NZ-6245	848 ± 35	AD1412-1471	Strombus sp.	Tmasch Village, OR-17:1, EU1, 0-10cm
NZ-6246	745 ± 31	AD1466-1542	Strombus sp.	Tmasch Village, OR-17:1, EU1, 30-40cm
NZ-6253	747 ± 32	AD1464-1540	Strombus sp.	Tmasch Village, OR-17:1, EU1, 70-80cm
DIC-2387	1070 ± 40	AD962-1017	Charcoal	Uchularois Cave, OR-17:10, TU1, N. ext. 90-100cm
NZ-6351	1345 ± 49	AD941-1061	Strombus sp.	Uchularois Cave, OR-17:10, TU1, N. ext. 90-100cm
NZ-6352	1125 ± 40	AD1193-1280	Strombus sp.	Uchularois Cave, OR-17:10, TU1, N. ext. 90-100cm
DIC-2388	1110 ± 50	AD888-989	Charcoal	Uchularois Cave, OR-17:10, TU1, N. ext. 163-175cm
DIC-2529	650 ± 50	AD1545-1658	Strombus sp.	Uchularois, Rois, OR-17:-- F-1, 20-30cm
NZ-5637	1270 ± 60	AD666-780	Charcoal	Uchularois Cave, OR-17:10, TU1, N. ext. 70-80cm
NZ-5638	1165 ± 85	AD775-906	Charcoal	Uchularois Cave, OR-17:10, TU1, N. ext. 110-120cm
NZ-5639	395 ± 133	AD1657-1729	Charcoal	Uchularois Cave, OR-17:10, TU1, N. ext. 40-50cm
NZ-5640	634 ± 79	AD1286-1396	Charcoal	Uchularois Cave, OR-17:10, TU1, N. ext. 30-40cm
DIC-2530	600 ± 40	AD1590-1696	Strombus sp.	Ngemelis Village, OR-17:6, EU1, 40-50cm
NZ-6247	1020 ± 40	AD1272-1353	Strombus/ Tridacna	Ikulauol, OR-17:8, EU1, 0-10cm



**MEMORANDUM OF UNDERSTANDING
BETWEEN THE PELELIU STATE GOVERNMENT
AND THE KOROR STATE GOVERNMENT
SETTING FORTH THE INITIAL FRAMEWORK
OF JOINT PARTNERSHIP AND COOPERATION**



**FOR THE PROTECTION AND SUSTAINABLE USE OF THE GERMAN CHANNEL AND
THE SAFETY AND SECURITY OF ALL WHO USE THE GERMAN CHANNEL**

WHEREAS, the Republic of Palau is world renowned for its "German Channel" and "German Drop-Off," and other snorkeling and scuba diving sites, in large part due to the numbers of aggregating fish in the area near the German Channel reefs and the German Drop-Off close to Ngemelis Islands and its surrounding area; and,

WHEREAS, the German Channel serves as a multiple-use area to include diving, snorkeling, and boat traffic from tour operators, recreational-water users and commuters to Peleliu and Angaur; and,

WHEREAS, unregulated type of fishing will serve to deplete fish stocks in the area, and will also apprise fish to become apprehensive of scuba divers and boats. International diving areas that enforce proper fishing regulations, such as the Great Barrier Reef and the Red Sea, contain large schools of fish which are not apprehensive of scuba divers and boats, thus serving to attract more visitors to these sites; and,

WHEREAS, the need for conservation of these precious natural resources is necessary not only to attract more visitors to the Ngemelis Islands and its surrounding area, but also to preserve the Ngemelis Islands and its surrounding area to include the German Channel reefs for generations of future Palauans; and,

WHEREAS, the Ngemelis Islands is a unique natural resource area known for its reefs and ocean resources, and in addition to the German Channel reefs are uniquely located, in part, on the boundaries of the States of Peleliu and Koror; NOW THEREFORE,

BE IT RESOLVED, that the undersigned representatives of the States of Peleliu and Koror will use all their best efforts, subject to the constitutional requirements and appropriate legal process of both States, including but not limited to, legislation, regulation, and conservation of the German Channel reef system in order to accomplish the goals of this Memorandum of Understanding, with the attached proposed legislation for consideration according to appropriate process of both the States as an initial step toward realizing these aforementioned goals.

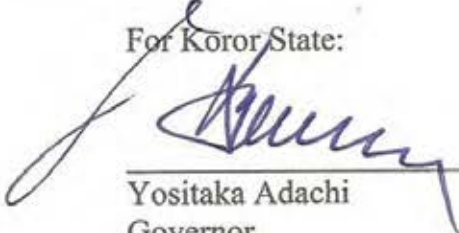
Agreed and approved this 20th day of January 2011.

For Peleliu State:



Kangichi Uchau
Governor
Peleliu State

For Koror State:



Yositaka Adachi
Governor
Koror State



Koror State Government

DEPARTMENT OF CONSERVATION
AND LAW ENFORCEMENT



STATE REGULATIONS FOR THE ROCK ISLANDS SOUTHERN LAGOON MANAGEMENT AREA

As of January 2011

Table 1 below shows a list of laws/regulations on the management area, including brief descriptions and effective dates.

Table 1. Summary of Koror State Acts & Regulations relevant to the Management Area			
Regulation	Purpose	Reference	Effective
General Resource Use			
To require all persons as tour guides in Koror State to pass Tour Guide Certification Program	To require the presence of a licensed Marine Tour Guide on all commercial marine tours to the Rock Islands and/or the water of Koror State; and to provide penalties for violations.	K9-233-2011	July 1, 2011
Prohibit construction in the rock islands of Koror	Prohibits any kind of construction building on the rock islands, except the construction or improvements made by KSG.	K9-122-10	2010
Permit for Shell Collection	Regulates collection of shells, except for scientific purposes or for food.	MO 46-69	1969
Photo Permit (commercial use)	Regulates commercial photography (still & movies) and the fees of motion picture permits as determined by the governor.	K8-202-2008	2008
Harvesting restrictions in the Rock Islands, Decree by Ngarameteki, Chief Council of Koror	Prohibits harvest of any marine or terrestrial life by non-residents of the State, & the taking of domestic animals to the Rock Islands.		1973
Fishing License (commercial)	Regulates commercial harvest of marine resources, & prohibits use of damaging fishing techniques.	K4-68-95	1995
Harvesting & cutting of vegetation in mangroves.	Prohibits the harvest/cutting of vegetation in mangroves & wetlands below the high tide line.	K6-110-2000	2000
Sardine harvesting restrictions	Prohibits the sale of sardines (mekebud) & restricts fishing or capture of sardines (mekebud, merau, & teber) at certain areas and for 4 days before & during full moon.	K6-95-99	1999
Economic & non-economic values of coral reef ecosystems	Recognizes the economic & non-economic values present in coral reef ecosystems in Koror State waters, & authorizes the Governor to put in effect rules & regulations to enforce this Act.	K6-121-2001	2001
Rock Islands Management & Conservation Act	Designates tourist activity areas and establishes the use of Rock Islands-Use and Jellyfish Lake permits.	K8-207-2009 K8-209-2009	2009
State Parks-Koror Side Japan Friendship Bridge & Long Island	Designates Koror State Parks in these two areas.	K7-132-2002	2002
Fishing License Amendment (Non-Commercial use)	Prohibits non-Palauan citizens from fishing from land on Koror Island. Fishing license permits fishing from a boat or registered watercraft only.	K7-138-2003	2003
Land Crab Act (rekung el daob, rekung el beab, kesuar)	Prohibits the taking, possession, & sale of live or dead land crabs during certain times, & undersized or berried crabs at any time.	K7-140-2003	2003
Prohibit Shark Feeding	It is unlawful to feed sharks in the waters of the State of Koror.	K8-186-2007	2007
Prohibit Fishing at Dive and Snorkel sites	No one may engage in fishing activities or possess any fish or fishing gear within 100 yards of dive/snorkel sites.	K8-191-2007	2007
Boating			
Boat Registration Act	To require boat registrations for a one year period from the date of registration instead of one calendar year.	K8-184-2007	2007
Cruising Yacht Permit (non-commercial)	To require permits to be obtained by owners or operators of cruising yachts when such yachts anchor, moor or dock within the territorial waters of the state of Koror.	K6-107-2000	2000
Live aboard Vessels	Limits the number of live-aboard vessels operating in KS, bans operation of new vessels, & established permit fees.	K6-124-2001	2001
Prohibit motorboat operation at Kerker ra Kosiil	Prohibits motorboat operation.	K7-130-2002	2002
Jetski & similar motorized personal watercraft	Establishes safety & operational regulations for personal watercraft & designates 4 water sport zones.	K7-139-2003	2003
Protected Areas			
Ngemelis Islands Conservation Zone	To establish a "no fishing" zone for all area within one mile of Ngemelis Islands complex, to prohibit the taking of flora and fauna from, and introduction of flora and fauna into, the Ngemelis Islands complex.	K9-229-2010	2010
Ngemelis Island Complex	Idle speed boat crossing at Toi Riobes permissible.	K8-192-2007	2007
Ngerukuid Islands Wildlife Preserve and Ngerumekaol Spawning Area	Prohibits transport of firearms or other weapons capable of killing or capturing birds, animals or marine life, bans transport of domestic animals, use of fire or cutting, destroying or removing plants. Prohibits fishing, killing, trapping or possession of fish at any time.	K6-101-99	1999
Soft coral arch, cemetery reef, & all marine lakes	Prohibits fishing, hunting or taking of any marine flora & fauna.	K6-95-99	1999
Ngederrak Reef	Establishes Ngederrak as a permanent conservation area.	K7-156-2005	2005
Ngerkebesang Conservation Zone	Prohibits fishing, hunting, taking or disturbance of any marine flora & fauna.	K7-136-2002	2002



Koror State Government

DEPARTMENT OF CONSERVATION
AND LAW ENFORCEMENT



Rock Islands Southern Lagoon Management Area

Rules and Regulations are subject to change without notification

Designated tourist activity areas

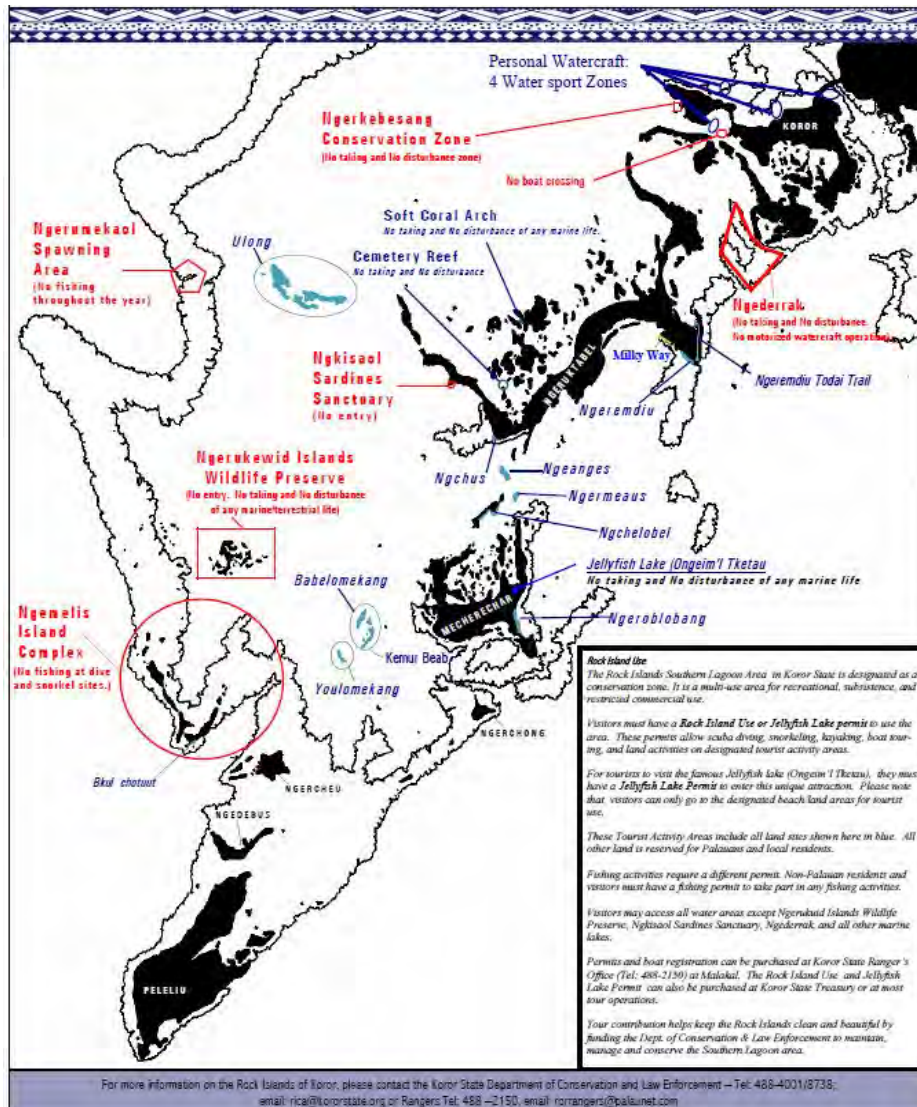
Jellyfish lake (Ongeim'l Tketau) on Mecherechar Island, Babelomekang Island, Ioulomekang Island, Ngchelobel beach area, Ngeanges Island, Ngermeaus Island, Ngchus beach area, Ngeremdiu/Ngeremdiu Todai Trail (German Lighthouse), Ulong Island and the Ngeroblobang beach area. All other land is reserved for residents of Palau.

Tourists may access all water areas except Ngkisaol Sardines Sanctuary, Ngerukuid Islands Wildlife Preserve, Ngederrak Reef, and Ngemelis Island Complex.

Regulations

Any visitor entering Palau on a tourist visa must have a valid Rock Islands-Use Permit or Jellyfish Lake Permit to access the Rock Islands Southern Lagoon Management Area. Rock Islands-Use Permits cost \$25 and are valid for 10 days. Permit allows for scuba diving, snorkeling, kayaking, boat touring and land activities on designated tourist activity areas. Jellyfish Lake permits cost \$35 and include all activities covered under the Rock Islands-Use Permits and access to Ongeim'l Tketau Jellyfish Lake.

Non-Palauan citizens and visitors must have a valid fishing license to take part in any fishing activities. License fee is \$20 per month, or \$200 per year. It is illegal for non-Palauan citizens to fish from land areas on Koror Island (includes all fringing reefs joined to land areas).





Koror State Government

DEPARTMENT OF CONSERVATION
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Fishing/Collection of Invertebrates

Koror State is responsible for enforcing all laws relating to fishing or the collection of invertebrates in the Management Area. These include both national and state laws. Table 2 below is a comprehensive list of all state laws pertaining to such activities.

Table 2. Koror State Fishing Regulations

- No fishing, hunting or disturbance or possession or transport of any firearms of any description, or other weapons, nets, traps, snares or objects or materials capable of killing, or otherwise taking birds, animals, or marine life in Ngerukuid Islands Wildlife preserve.
- No fishing all year round, no hunting, disturbance or possession of any fish in Ngerumekaol Spawning Area (Ulong Channel).
- No fishing, hunting or disturbance of sardines within 100 yards of Ngkisaol (Inlet) Sardines sanctuary.
- No selling of sardines (*mekebud, merau, teber*) at any time in Koror State.
- No fishing of sardines (*mekebud, merau, teber*) 4 days before and during the full moon.
- No fishing, hunting, taking or disturbance of any marine flora and fauna at Soft Coral Arch, Cemetery Reef, any marine lake and the Ngerkebesang Conservation Zone.
- No hunting or fishing, no taking, removal, or disturbance of any marine flora and fauna and no entry of motorized watercraft at Ngederrak Reef Area (permanent conservation moratorium).
- No fishing zone for all area within one mile of Ngemelis Islands complex, to prohibit the taking of flora and fauna from, and introduction of flora and fauna into, the Ngemelis Islands complex.
- No one may engage in fishing activities or possess any fish or fishing gear within 100 yards of dive/snorkel sites
- All non-Palauan citizens and tourists must attain a fishing license to partake in recreational fishing activities. Non-Palauan citizens are prohibited from fishing on any kind of land or improvements to land on the Island of Koror, and may only engage in fishing activities from a boat or registered watercraft.
- Licenses are required for all commercial fishing in Koror State Waters.
- In addition to no-take areas, the following fishing methods are prohibited:
 - Spear fishing using a spear or projectile powered by gas or any explosive mechanism;
 - Fishing with the assistance of any explosive substance or any harmful substance or poison;
 - Fishing using any net with mesh smaller than 3 inches on any side of the hole;
 - Commercial fishing within the reef by foreign licensee or any company with foreign partnership or joint venture;
 - Drag and drift net fishing both inside and outside the reef except for the purpose of bait collection;
 - Fishing using any net that is moved by any vessel;
 - Fishing using any form of mechanically compressed air or other breathing apparatus;
 - Receiving, buying, transporting, storing, using, eating, or selling any fish obtained in violation of this law;
 - Fishing for trochus at any time except during the trochus season as mandated by the ROP, unless further restricted by Koror State.

Table 3. Koror State Land Crab Regulations

The harvesting restrictions in Table 4 lists invertebrates as regulated by National Law. The Koror State Land Crab Act prohibits the taking, possession, and sale of live or dead land crabs (*rekung el daob, rekung el beab and kesuar*) from midnight on the second day before the day and night of the full moon, and on the day and night of the full moon for a total period of 3 days around the time of each full moon. The act also prohibits the taking of undersize land crabs, smaller than 3 inches (largest carapace width) and the taking, possession, sale, exchange of land crabs with eggs (*berried*) at any time.



Koror State Government

DEPARTMENT OF CONSERVATION
AND LAW ENFORCEMENT



Table 4. Fish Species Regulated by National Law

Palauan name	FAO common name	Scientific name	Minimum Size	Harvesting Season	Other restrictions
Meteungere' temekai Ksau' temekai Tiau Mokas Katuu' tiau Tiau	Brown marbled grouper Camouflage grouper Squaretail coral grouper Blacksaddled coral grouper Blacksaddled coral grouper Leopard coral grouper	<i>Epinephelus fuscoguttatus</i> <i>Epinephelus polyphkadion</i> <i>Plectropomus areolatus</i> <i>Plectropomus laevis</i> <i>Plectropomus laevis</i> <i>Plectropomus leopardus</i>	No	Closed April 1 thru July 31	Illegal to buy or sell during closed season.
Meyas	Rabbitfish	<i>Siganus canaliculatus</i>	No	Closed February 1 thru March 31	Illegal to buy or sell during closed season
Berdebed, kemedukl	Humphead parrotfish	<i>Bolbometopon muricatum</i>	Closed permanently	Closed permanently	No export No possession
Ngimer; maml	Humphead wrasse (also known as Napoleon Wrasse)	<i>Chelinus undulatus</i>	Closed permanently	Closed permanently	No export No possession
Aquarium Species	Various fish, anemones, jellyfish, sponges, crustaceans, and mollusks.		No	Open	Fishing & export restricted to people in possession of an Aquarium Collecting Permit.

Table 5. Invertebrate Species Regulated by National Law

Palauan name	Common name	Scientific name	Minimum size	Harvesting season	Other restrictions
Cheraprulki; Raikilius; Bleyached; Melech	Rock Lobsters	<i>Panulirus versicolor</i> <i>Panulirus penicillatus</i> <i>Panulirus longipes femorstriga</i>	3.5 inches total length of the carapace	Open	No export; no taking of egg-bearing females whatever the length; no possession of undersized specimens.
Emang	Mangrove crab	<i>Scylla serrata</i>	6 inches greatest distance across the carapace	Open	No export; no taking of egg-bearing females whatever the length; no possession of undersized specimens.
Ketat	Coconut crab	<i>Birgus latro</i>	4 inches greatest distance across width of carapace	Open	No export; no taking of egg-bearing females whatever the length; no possession of undersized specimens.
Oktang Ribkungal Kism Melibes Oruer Duadeb Duaedeb	Giant clams	<i>Tridacna gigas</i> <i>Tridacna squamosa</i> <i>Tridacna derasa</i> <i>Tridacna maxima</i> <i>Tridacna crocea</i> <i>Hippopus hippopus</i> <i>Hippopus porcellanus</i>	No	Open	No export (except cultured specimens)
Semum	Trochus	<i>Trochus niloticus</i>	3 inches basal diameter	Designated from year to year by OEK	State Government can designate closed areas during open seasons
Chesiuch	Blacklip pearl oyster	<i>Pinctada margaritifera</i>	4 inches diameter across the shell	Closed August thru December	
Bakelungal chedelkelek Bakelungal cherou Molech Badelchelid Eremrum Temetamel	Sea cucumbers	<i>Holothuria nobilis</i> <i>Hothothuria fuscogilva</i> <i>Holothuria scabra</i> <i>Actinopyga mauritiana</i> <i>Actinopyga miliaris</i> <i>Thelenota ananas</i>	No	Open	No export



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Sponges, hard corals, marine rock	<i>Porifera</i> sp. <i>Scleratinia</i> , <i>Hydrocorallina</i> , <i>Coenothecailia</i> , <i>Stolnifera</i>	No	Open	No export
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Table 6. National Regulations for Turtle Harvest (as of December 2010)					
Palauan name	Common name	Scientific name	Minimum size	Harvesting season	Other restrictions
Melob	Green Turtle	<i>Chelonia mydas</i>	34 inches carapace length	Closed May thru August & Dec thru Jan.	No taking of eggs, no taking of female while she is on shore.
Ngasech	Hawksbill turtle	<i>Eretmochelys imbricata</i>	Closed – for five (5) years	Closed for five(5) years	No taking of eggs, no taking of female while she is on shore.
All Sea Turtles	All Species			Closed May thru August & Dec thru Jan.	No taking of eggs, no taking of female while she is on shore.

Forest and Terrestrial

Restrictions Applicable to Forest and Terrestrial Areas

- No harvesting of vegetation in mangroves and wetlands below high tide.
- No hunting, killing or taking eggs from any birds except Malk-Red Jungle Fowl (*Gallus gallus*), Uek-Purple Swamphe (*Porphyrio porphyrio*), Aiako-Greater Sulphur-crested Cockatoo (*Cacatua galerita*), and Tengadidik-Collared Kingfisher (*Halcyon chloris*).
- No dumping of trash, litter must be removed from land and marine areas.
- No taking of any flora or fauna from any Tourism Zones.
- No harvesting of wood products except for approved traditional/cultural functions.

Calendar of Closed Seasons

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Groupers (Tiau, Katuu'tiau, mokas', Ksau'temekai, meteungeril'temekai)				X	X	X	X					
Rabbitfish (Meyas)			X	X	X							
Blacklip Pearl Oyster								X	X	X	X	X
All Sea Turtles (includes Green turtle, Melob)	X				X	X	X	X				X
Hawksbill Turtle (Ngasech) Closed Five Years (2010-2015)	X	X	X	X	X	X	X	X	X	X	X	X
House Parties, ocheraol, and cheldech duch	X				X			X			X	X

- Sardines (Mekebud, merau, teber) – Closed 4 days before and during the full moon of every month.



Koror State Government

DEPARTMENT OF CONSERVATION
AND LAW ENFORCEMENT



- Trochus – Closed and open seasons designated from year to year by the OEK.
- Land Crabs (Rekung el daob, rekung el beab, kesuar) – No taking possession or sale of live or dead land crabs from midnight on the second day before the day and night of the full moon until midnight the day after the full moon, for a total of 3 days around the full moon.
- Cheldech duch, ocheraol, and house parties – No person or entity may hold or conduct an ocheraol, cheldech duch, or house party in the State of Koror at any time during the months of January, May, August, November, and December.

Other Prohibited Actions	Criminal Penalties
Fishing while using form of underwater breathing apparatus other than a snorkel.	\$500 fine, or Up to 1 year in jail, or Both of the above for each violation
Making any entry or statement in writing completed or submitted in connection with the export of fish which is false or misleading.	Fine of not less than \$400, or 6 months to 2 years in jail, or Both of the above for each violation
1. Fishing with gill or surround net with a mesh size of less than 3 inches 2. Retaining, possessing or abandoning kesokes net with a mesh size of less than 3 inches measured diagonally.	1 st conviction : up to \$250 2 nd conviction : up to \$500 and 30 days in jail 3 rd conviction : \$1000 and 6 months in jail Thereafter : \$5000 and 1 year in jail
1. Fishing with poison or explosives 2. Putting poison or explosives in the water for any reason, even by mistake	Felony: \$100 to 2000 fine and 6 months to 2 years in jail \$100 fine and Up to 6 months in jail
Feeding sharks in water of the State of Koror, or assist such person to do so.	\$100 fine or Up to 90 days in jail.
Fishing within 100 yards at any dive/snorkel sites.	\$100 fine or Up to 90 days in jail.

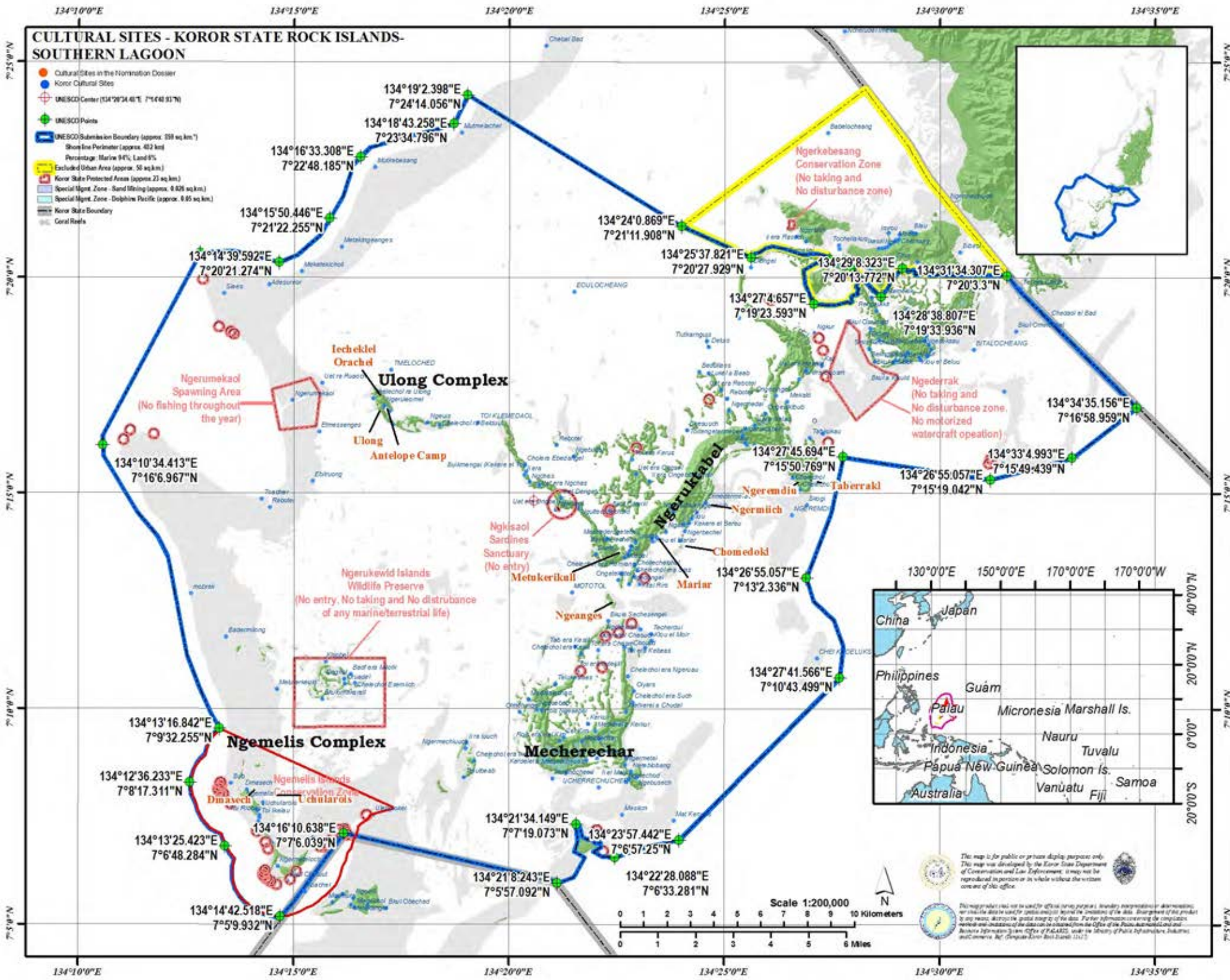
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**Appendix G. 2010 Rock Islands Southern Lagoon Budget (Koror State Department of Conservation and Law Enforcement)**

| <b>Purpose</b>                                    | <b>US\$</b>           |
|---------------------------------------------------|-----------------------|
| <b>Daily Operations</b>                           |                       |
| Personnel                                         | \$570,000.00          |
| ICDF Volunteer Housing                            | \$8,000.00            |
| Capital Assets                                    | \$80,000.00           |
| Communication Equipment                           | \$25,000.00           |
| Vehicle Parts & Maintenance                       | \$3,500.00            |
| Patrol Boat Parts & Maintenance                   | \$10,000.00           |
| Supplies                                          | \$15,000.00           |
| Uniform & Accessories                             | \$3,500.00            |
| Marine Buoys, Channel Markers, & Drilling Machine | \$50,000.00           |
| Fuel Expense                                      | \$175,000.00          |
| Contingency                                       | \$2,500.00            |
| Miscellaneous                                     | \$2,500.00            |
| Staff Training                                    | \$5,000.00            |
| <b>TOTAL DAILY OPERATIONS</b>                     | <b>\$958,000.00</b>   |
| <b>Special Programs and Projects</b>              |                       |
| Coastal Management                                | \$30,000.00           |
| Picnic Huts                                       | \$20,000.00           |
| Bio-toilets                                       | \$50,000.00           |
| <b>TOTAL SPECIAL PROJECTS</b>                     | <b>\$100,000.00</b>   |
| <b>2010 TOTAL</b>                                 | <b>\$1,008,000.00</b> |





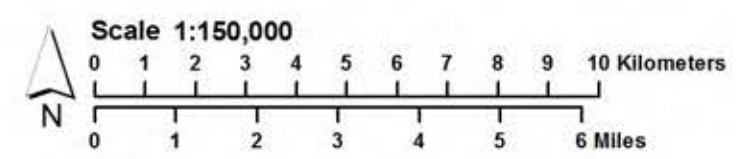
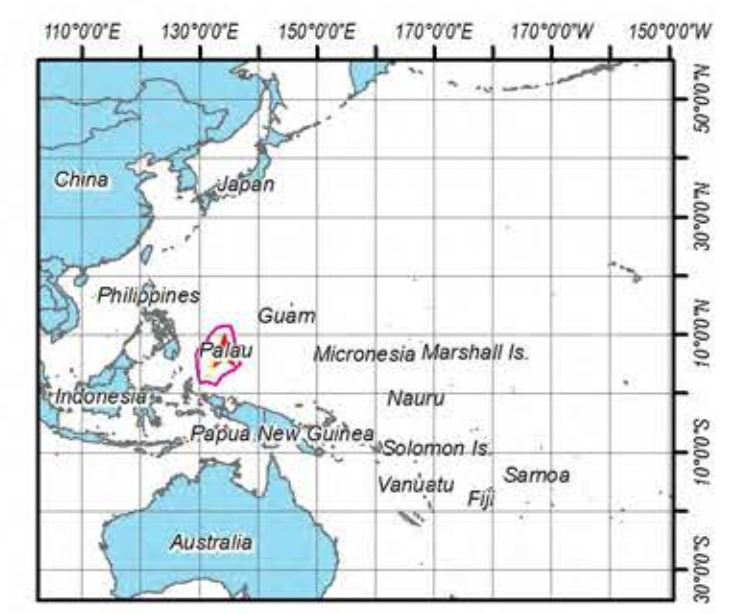
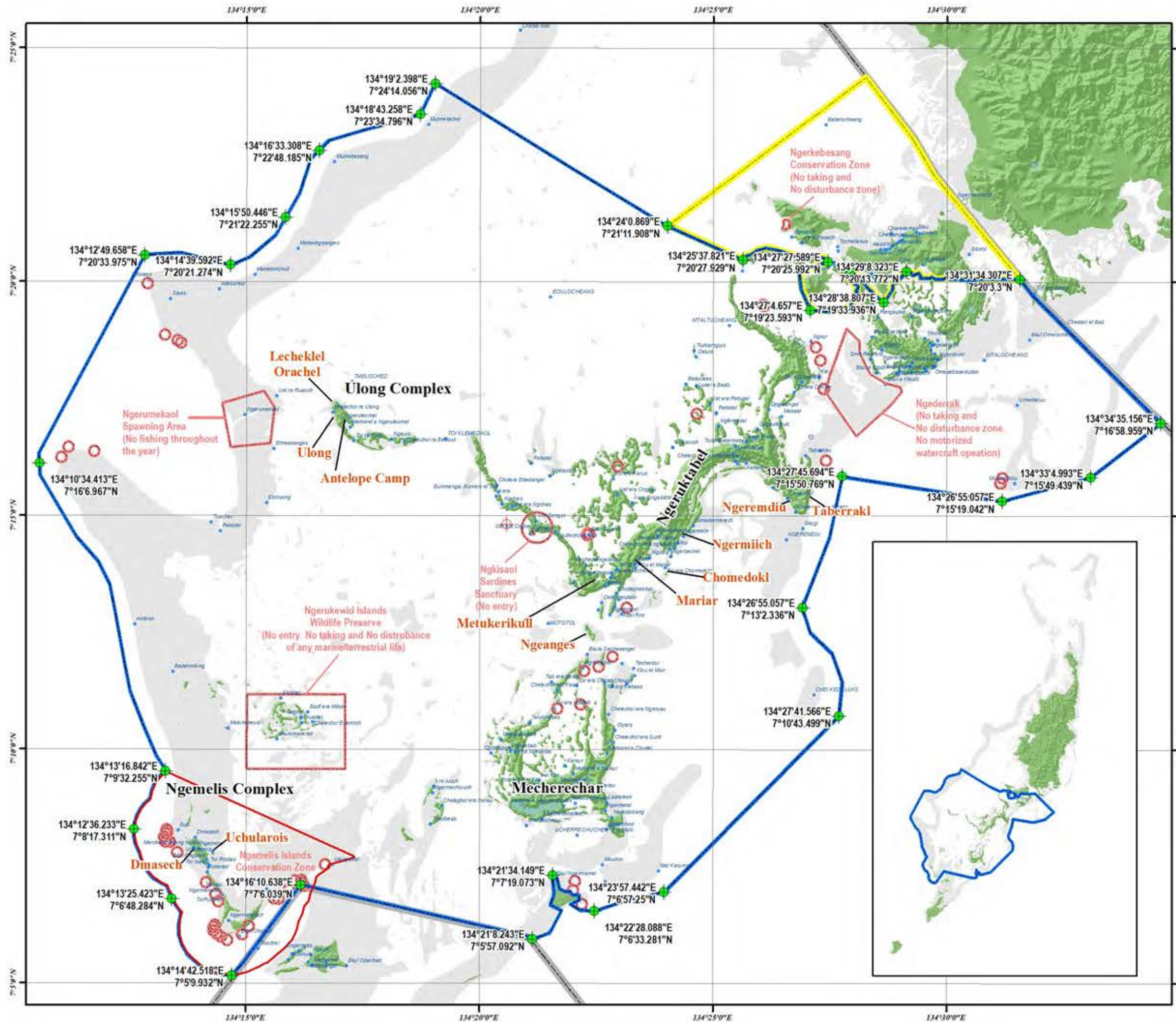
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# CULTURAL SITES - KOROR STATE ROCK ISLANDS SOUTHERN LAGOON

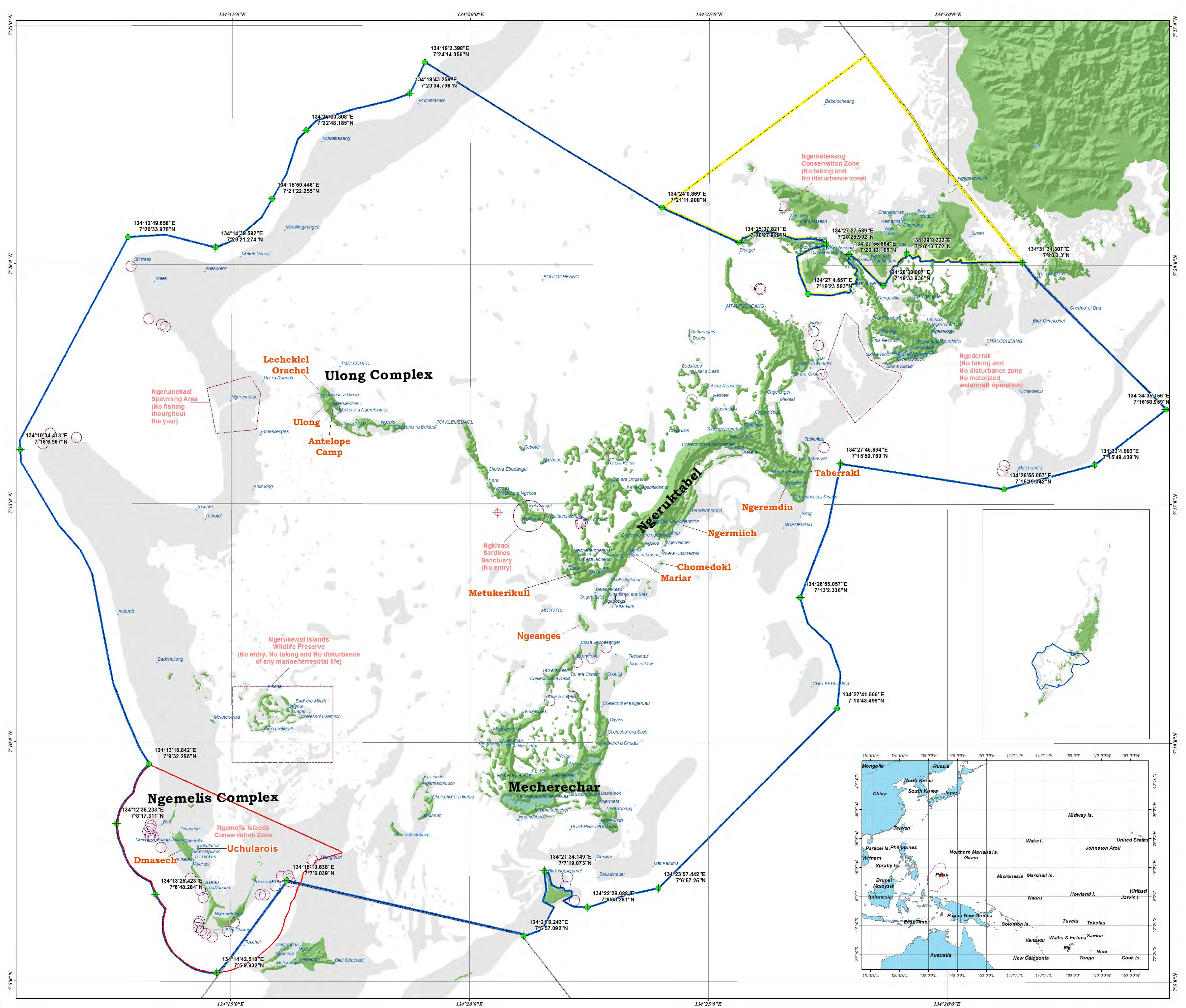
## Legend

- Cultural Sites in the Nomination Dossier
- Koror Place Names
- ⊕ UNESCO Center (134°20'34.48"E 7°14'48.93"N)
- UNESCO Points
- UNESCO Submission Boundary (approx. 859 sq.km.)  
Shoreline Perimeter (approx. 482 km)  
Percentage: Marine 94%; Land 6%
- Excluded Urban Area (approx. 58 sq.km.)
- Koror State Protected Areas (approx. 23 sq.km.)
- Special Mgmt. Zone - Sand Mining (approx. 0.026 sq.km.)
- Special Mgmt. Zone - Dolphins Pacific (approx. 0.05 sq.km.)
- Koror State Boundary
- Coral Reefs



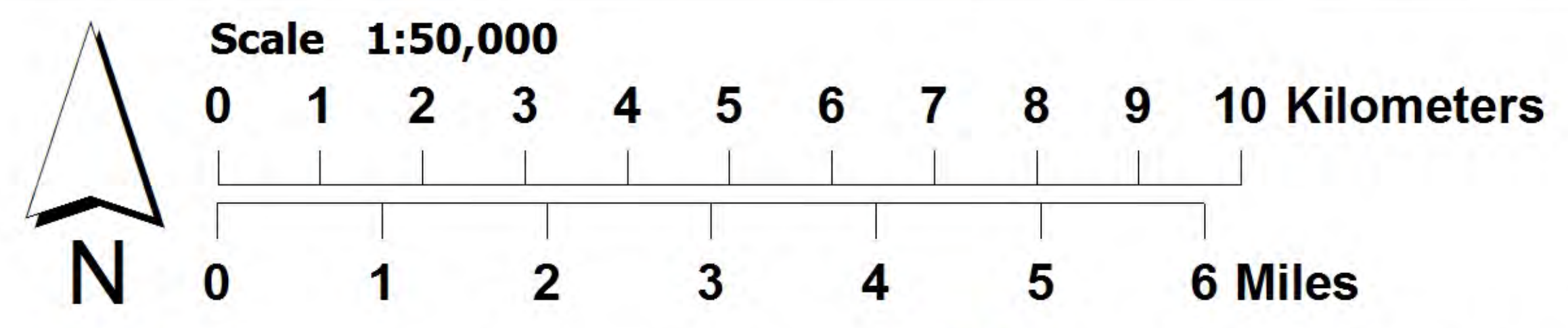
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# CULTURAL SITES - KOROR STATE ROCK ISLANDS - SOUTHERN LAGOON

- Legend**
- Cultural Sites in the Nomination Dossier
  - Koror Place Names
  - ⊕ UNESCO Center (134°20'34.48"E 7°14'48.93"N)
  - ◆ UNESCO Points
  - UNESCO Submission Boundary (approx. 859 sq.km.)\*
  - Koror State Protected Areas (approx.23 sq.km.)
  - Koror State Boundary
  - Coral Reefs
  - Excluded Urban Area (approx. 58 sq.km.)
- Percentage: Marine 94%; Land 6%



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## **General Provisions**

§ 101. Short title.

§ 102. Public policy.

§ 103. Definitions.

### **§ 101. Short title.**

This chapter may be cited as the “**Environmental Quality Protection Act.**”

### **§ 102. Public policy.**

(a) The Olbiil Era Kelulau, recognizing the profound impact of human activity on the interrelations of all components of the natural environment, particularly the profound influences of population growth and redistribution, cultural change, resource exploitation, and technological advances, and recognizing further the critical importance of restoring and maintaining **environmental quality** to the overall welfare and development of humankind, declares that it is the continuing policy of the national government, in cooperation with state governments, and other concerned public and private organizations, to use all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which humankind and nature can coexist in productive harmony, and fulfill the social, economic and other requirements of present and future generations of the Republic.

(b) In order to carry out the policy set forth in this chapter, it is the continuing responsibility of the national government to use all practicable means, consistent with other essential considerations of national policy, to improve and coordinate governmental plans, functions, programs, and resources to the end that the inhabitants of the Republic may:

(1) fulfill the responsibility of each generation as trustee of the environment for succeeding generations;

(2) assure for all Palauans ~~safe~~, healthful, productive, and aesthetically and culturally pleasing surroundings;

(3) attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences; and

(4) preserve important historical, cultural and natural aspects of our Palauan heritage, and maintain, wherever possible, an environment which supports diversity and variety of individual choice.

(c) The Olbiil Era Kelulau recognizes that each person has a fundamental right to a healthful environment and that each person has a responsibility to contribute to the preservation and enhancement of the environment.

### § 103. Definitions.

In this chapter:

- (a) “Administrator” means the Administrator of the United States **Environmental Protection Agency**.
- (b) “Board” means the Palau **Environmental Quality Protection Board**.
- (c) “Chairman of the Palau **Environmental Quality Protection Board**” or “chairman” means the chairman personally or his duly authorized representative.
- (d) “Federal **Acts**” means the United States Safe Drinking Water **Act**, Public Law 93- 523; the United States Federal **Environmental Pesticide Control Act** of 1972, Public Law 92-516; and the United States Federal Water Pollution Control **Act**, as amended, Public Law 92-500.
- (e) “Person” means the Republic of Palau, a state, a political subdivision, a public or private institution, corporation, partnership, joint venture, association, firm, or company organized or existing under the laws of the Republic or of any state or country, a lessee or other occupant of property, or an individual, **acting** singly or as a group.
- (f) “Primary drinking water regulation” means a regulation which:
  - (1) applies to public water systems;
  - (2) specifies contaminants which, in the judgment of the Board, may have any adverse effect on the health of persons; and
  - (3) specifies for each such contaminant either:
    - (A) a maximum contaminant level, if, in the judgment of the Board, it is economically and technologically feasible to ascertain the level of such contaminant in water in public water systems; or
    - (B) if, in the judgment of the Board, it is not economically or technologically possible to so ascertain the level of such contaminant, each treatment technique known to the Board which leads to a reduction in the level of such contaminant sufficient to satisfy the requirements of section 1412 of the United States Safe Drinking Water **Act**, Public Law 93-523; and
  - (4) contains criteria and procedures to assure a supply of drinking water which dependably complies with such maximum contaminant levels, including **quality** control and testing procedures to insure compliance with such levels and to insure proper operation and maintenance of the system, and requirements as to:
    - (A) the minimum **quality** of water which may be taken into the system; and

(B) siting for new facilities for public water systems.

(g) “Public water system” means a system for the provision to the public of piped water for human consumption, if such system has at least 15 service connections or regularly serves at least 25 individuals. Such term includes:

- (1) any collection, treatment, storage, and distribution facilities under control of the operator of such system and used primarily in connection with such system; and
- (2) any collection or pretreatment storage facilities not under such control which are used primarily in connection with such system.

(h) “Secondary drinking water regulation” means a regulation which applies to public water systems and which specifies the maximum contaminant levels which in the judgment of the Board are requisite to **protect** the public welfare. Such regulations may apply to any contaminant in drinking water:

- (1) which may adversely affect the odor or appearance of such water and consequently may cause a substantial number of persons served by the public water system providing such water to discontinue its use; or
- (2) which may otherwise adversely affect the public welfare.

Such regulations may vary according to geographic and other circumstances.

(i) “State plan” means an individual plan for:

- (1) the certification of pesticides under section 4 of the Federal Insecticide, Fungicide, and Rodenticide **Act** (FIFRA), as amended, or
- (2) the issuance of pesticide product registrations to meet special local needs as defined under section 24(a) of FIFRA, as amended; or
- (3) the issuance of experimental use permits under section (5)(f) of FIFRA, as amended.

The Safe Drinking Water **Act** referred to in subsection (d) is found generally at 42 U.S.C. §§ 300f to 300j 10; the Federal **Environmental Pesticide Control Act** of 1972 is found generally at 7 U.S.C. §§ 136 to 136y; the Federal Water Pollution Control **Act** is found generally at 33 U.S.C. §§ 1251 to 1376. The Federal Insecticide, Fungicide, and Rodenticide **Act** (FIFRA) referred to in subsection (i) is synonymous with the Federal **Environmental Pesticide Control Act** of 1972, the former **Act** having been completely revised by the latter.

## **Subchapter II**

### **Palau **Environmental Quality Protection Board****

- § 128. Annual **environmental quality** report.
- § 129. Powers and duties.
- § 131. Mitigation Trust Fund.

**§ 128. Annual environmental quality report.**

The Board shall transmit to the President and the Olbiil Era Kelulau not later than January 31 of each year an environmental quality report for the preceding calendar year. The report shall set forth:

- (a) The status and condition of the major natural, man-made, or altered environmental classes of the Republic, including, but not limited to, the air; the waters, including marine, estuarine, and fresh water; and the terrestrial environment, including, but not limited to, the forest, mangrove area, beaches, reefs, dryland, wetland, urban and rural environment;
- (b) Current and foreseeable trends in the quality, management and utilization of such environments and the effects of those trends on the social, economic, and other requirements of the Republic;
- (c) The adequacy of available natural resources for fulfilling human and economic requirements of the Republic in light of expected population pressures;
- (d) A review of the programs and activities (including regulatory activities) of the national government, state governments, and nongovernmental entities or individuals, with particular reference to their effect on the environment, the conservation, development and utilization of natural resources and the social and economic requirements of the Republic; and
- (e) A program for remedying the deficiencies of existing programs and activities, together with recommendations for legislation.

**§ 129. Powers and duties.**

- (a) The Board shall promulgate and enforce primary drinking water regulations and may promulgate and enforce secondary drinking water regulations. The Board shall also have the power to promulgate and enforce such other regulations as are necessary to carry out the purposes of the United States Safe Drinking Water Act, Public Law 93-523, and any applicable regulations promulgated thereunder.
- (b) The Board shall establish and provide for the continuing administration of a permit system, whereby a permit shall be required for the discharge by any person of any pollutant in the air, land, or water, or for the conduct by any person of any activity, including, but not limited to, the operation, construction, expansion or alteration of any installation which results in or may result in the discharge of any pollutant in the air, land or water. The Board shall also provide for the issuance, modification, suspension, revocation and termination of such permits, and for the posting of an appropriate bond.
- (c) The Board shall adopt and implement plans for the certification of applicators of pesticides, for the issuance of experimental use permits for pesticides and a plan to meet local needs. The Board shall also adopt and implement such other measures as necessary to carry out the purposes of the United States FIFRA, Public Law 92-516.
- (d) The Board shall promulgate and enforce nuclear and other hazardous wastes regulations.
- (e) The Board shall promulgate and enforce regulations for the purposes of this

chapter, including monitoring, inspection, and record-keeping procedures that comply with regulations established by the Administrator pursuant to the Federal Acts.

(f) The Board is authorized and empowered to:

(1) establish criteria for classifying air, land, and water in accordance with present and future uses.

(2) publish technical manuals establishing procedures and criteria for the administration and enforcement of the Board's regulations, which shall have the force and effect of law.

(3) accept appropriations, loans, and grants from the United States Government or any agency thereof and other sources, public or private, which appropriations, loans, and grants shall not be expended for other than the purposes of this chapter.

### **§ 131. Mitigation Trust Fund.**

(a) There is hereby created within the National Treasury a special fund to be identified as "The Environmental Quality Protection Board Mitigation Trust Fund" which shall be segregated from other funds of the National Government. This Trust Fund shall ensure the Environmental Quality Protection Board's compliance with its duty to collect fines and penalties. Into this Trust Fund shall be deposited all revenues collected as penalties for violations of the Environmental Quality Protection Act. All monies received pursuant to this section shall be used at the direction of the Board exclusively for the purpose of mitigating environmental damages and disasters.

(b) The Board shall submit monthly expenditure reports for the Environmental Quality Protection Board Mitigation Trust Fund to the President and the Olbiil Era Kelulau.

### **Subchapter III**

#### **Environmental Studies and Decisions**

§ 142. Environmental studies and decisions; interpretation of applicable law.

§ 143. Same; environmental impact statements.

#### **§ 142. Same; role of agencies and state governments.**

All agencies of the national government and all state governments shall:

(a) utilize a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences, traditional wisdom, and the environmental design arts in planning and in decision making which may have an impact on the environment;

(b) identify and develop methods and procedures, in consultation with the Board, which will insure that presently unquantified environmental amenities and values may be given appropriate consideration in decision making along with economic and technical considerations; and



(c) include in every recommendation or report on proposals for legislation and other major government actions significantly affecting the **quality** of the human environment, a detailed **environmental** impact statement by the responsible official on:

- (1) the **environmental**, including cultural, impact of the proposed action;
- (2) any adverse **environmental** effects which cannot be avoided should the proposal be implemented;
- (3) alternatives to the proposed action;
- (4) the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity; and
- (5) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.

(d) study, develop and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources;

(e) recognize the worldwide and long-range character of **environmental** problems and lend appropriate support to initiatives, resolutions and programs designed to maximize international cooperation in anticipating and preventing a decline in the **quality** of the world environment;

(f) make available, to states, institutions, and individuals, advice and information useful in restoring, maintaining, and enhancing the **quality** of the environment;

(g) initiate and utilize ecological information in the planning and development of resource oriented projects; and

(h) assist the Board.

(i) Where a state government is restoring an existing dock, pier, waterway, or taro patch, the state must seek prior approval of the Board. The state shall provide to the Board a description of the proposed restoration. The Board will have thirty (30) days in which to evaluate the proposal and provide the state with instructions on how to proceed. The Board may require the state to make an **environmental** impact statement required pursuant to subsection (c) or may provide the state an exemption from such. In either instance, the Board will work with the state to formulate an **environmentally** sound plan to make the restoration. This subsection does not apply to new construction.

**§ 143. Same; **environmental** impact statements.**

(a) Prior to making any detailed **environmental** impact statement, the responsible government official shall consult with and obtain the comments of the interested public and any national government agency which has jurisdiction by law or special expertise with respect to any **environmental** impact involved. Copies of such statement and the comments and views of the appropriate agencies shall be made available to the Board and to the public for inspection and

copying, and the public shall be notified of the existence of the **environmental** impact statement a reasonable time before completion of the governmental decision making process.

(b) The **environmental** impact statement shall accompany the proposal through the existing agency review process, and the decision as to such action under consideration shall be explained in a statement of basis and purposes which shall include, but need not be limited to, findings by the responsible official that:

(1) the **environmental** impact of the proposed action has been studied and considered by the responsible governmental agency;

(2) alternatives to the proposed action have been given reasonable consideration;

(3) any adverse **environmental** effects which cannot be avoided by following reasonable alternatives are justified by other stated considerations of national policy;

(4) any local short-term uses of the environment are consistent with maintaining and enhancing long-term productivity; and

(5) any irreversible and irretrievable commitments of resources are warranted.

#### **Subchapter IV**

#### **Implementation, Enforcement and Court Action**

§ 161. Board right of entry.

§ 168. Same; equitable relief.

§ 169. Same; where administrative, licensing or other proceedings available.

§ 171. Prohibited **acts**; fines, penalties and damages.

§ 172. Transition.

#### **§ 161. Board right of entry.**

Whenever it is necessary for the purposes of this chapter, the Board, or any member, agent or employee when duly authorized by the Board or by court order, may, at reasonable times, enter any establishment or upon any property, public or private, for the purpose of obtaining information, making inspections, obtaining samples, inspecting or copying records required to be maintained by the provisions of this chapter and any regulations promulgated thereunder, or conducting surveys or investigations for the purpose of carrying out the purpose and policy of this chapter.

(a) Any person who violates any provision of this chapter shall be subject to enforcement action by the Board. Such enforcement action may include, but is not limited to, issuance of an order to cease and desist from such violation, imposition of a civil penalty of up to \$10,000.00 for each day of violation, or commencement of a civil action to enjoin such violation.

(b) Whenever the Board finds that a discharge of waste is taking place or threatening to take place within the Republic that violates or will violate requirements prescribed by the Board, or finds that the waste collection, treatment, or disposal facilities of a discharger are approaching capacity, the Board shall require the discharger to submit for approval of the Board, with such modifications as it may deem reasonably necessary, a detailed time schedule of specific

actions the discharger shall take in order to correct the situation or prevent a violation of the requirements.

(c) When the Board finds that a discharge of waste is taking place or threatening to take place within its jurisdiction in violation of requirements of discharge prohibitions prescribed by the Board, the Board shall issue an order to cease and desist and direct that those persons not complying with requirements or discharge prohibitions comply forthwith, comply in accordance with a time schedule set by the Board, or, in the event of a threatened violation, take appropriate remedial or preventive action. In the event of an existing or threatened violation of waste discharge requirements in the operation of a community system, cease and desist orders may restrict or prohibit the volume, type, or concentration of waste that might be added to such system by dischargers who did not discharge into the system prior to the issuance of the cease and desist order.

(d) A public hearing to determine the authenticity of the facts upon which the cease and desist order was issued shall be conducted by the Board, adequate notice of which, and opportunity to appear and be heard at which, shall be afforded to all interested persons.

(e) Cease and desist orders of the Board shall become effective upon issuance, and final as to the Board upon issuing findings after a public hearing. Copies shall be served forthwith by registered mail upon the person being charged with the violation of the requirements and upon other affected persons who appeared at the hearing and requested a copy.

(f) Any person who discharges any pollutant into the water, air, or on the land in violation of any discharge permit, requirements, or other order issued by the Board, or who intentionally or negligently causes or permits any pollutant to be deposited where it is discharged into the water, air or on the land, shall, upon order of the Board, clean up such pollutant or abate the effects thereof. Upon failure of any person to comply with such cleanup or abatement order, the Minister of Justice, or his designated representative, at the request of the Board, shall petition the Trial Division of the Supreme Court for the issuance of an injunction, writ of mandamus or other appropriate remedy requiring such persons to comply therewith.

(g) The provisions of this section shall be interpreted consistently with the provisions of any law concerning administrative procedure which is or may hereafter become law. In the event of conflict between the two, the provisions of the latter shall supersede and be controlling.

**§ 168. Same; equitable relief.**

The court may grant temporary and permanent equitable relief, or may impose conditions on the defendant that are required to **protect** the air, water and other natural resources or the public trust therein from pollution, impairment or destruction.

**§ 169. Same; where administrative, licensing or other proceedings available.**

(a) If administrative, licensing or other proceedings are required or available to determine the legality of the defendant's conduct, the court may remit the parties to such proceedings, which proceedings shall be conducted in accordance with and subject to the provisions of this chapter. In so remitting, the court may grant temporary equitable relief where necessary for the **protection** of air, water and other natural resources or the public trust therein from pollution, impairment or destruction. In so remitting, the court shall retain jurisdiction of the

action pending completion thereof for the purpose of determining whether adequate protection from pollution, impairment or destruction has been afforded.

(b) Upon completion of such proceedings, the court shall adjudicate the impact of the defendant's conduct on the air, water or other natural resources and on the public trust therein in accordance with this chapter. In such adjudication the court may order that additional evidence be taken to the extent necessary to protect the rights recognized in this chapter.

(c) Whenever administrative, licensing or other proceedings and judicial review thereof are available by law, the agency or the court may permit the Minister of Justice, any political subdivision of the Republic, any instrumentality or agency of the Republic or of a political subdivision thereof, any person, partnership, corporation, association, organization or other legal entity to intervene as a party on the filing of a plea asserting that the proceeding or action for judicial review involves conduct which has, or which is likely to have, the effect of polluting, impairing or destroying the air, water or other natural resources or the public trust therein.

(d) In any such administrative, licensing or other proceeding and in any judicial review thereof, any alleged pollution, impairment or destruction of the air, water or other natural resources, or the public trust therein shall be determined, and no conduct shall be authorized or approved which does or is likely to have such effect, so long as there is a feasible and prudent alternative consistent with the reasonable requirements of the public health, safety and welfare.

**§ 171. Prohibited acts; fines, penalties and damages.**

(a) Any person who violates any provision of this chapter, or of any permit, regulation, standard or order issued or promulgated hereunder, shall be subject to a civil penalty not to exceed \$10,000.00 per day of violation. Such sums shall be paid into the National Treasury.

(b) The Minister of Justice or his designated representative, upon request of the Board, shall petition the Trial Division of the Supreme Court for a judgment assessing damages. In determining such damages, the court shall consider all relevant circumstances, including, but not limited to, the extent of harm caused by the violation, the nature and persistence of the violation, the length of time over which the violation occurs and the corrective action, if any, taken by the discharger.

(c) Any person who willfully or negligently:

(1) discharges pollutants in violation of this chapter or in violation of any condition or limitation included in a permit issued under section 129 of this chapter; or

(2) violates the requirements of section 129 of this chapter; or

(3) with respect to introduction of pollutants into publicly owned treatment works, violates a pretreatment standard or toxic effluent standard; shall be guilty of a misdemeanor, and upon conviction thereof, shall be punished by a fine of not less than \$2,500.00 nor more than \$25,000.00 per day of violation. If such

conviction is for a violation committed after a first conviction of such person under this chapter, punishment shall be by a fine of not less than \$10,000.00 nor more than \$50,000.00 per day of violation.

(d) Any person who knowingly makes any false statement, representation, or certification in any application, record, report, plan, or other document filed or required to be maintained under this chapter, or by any permit, regulation or order issued under this chapter, or who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this chapter or by any permit, regulation, or any order issued under this chapter, shall be guilty of a misdemeanor, and upon conviction thereof, shall be punished by a fine of not more than \$10,000.00, by imprisonment for not more than six months, or both.

### **§ 172. Transition.**

In order to ensure continued compliance with the requirements of the Federal Acts and the United States Environmental Protection Agency for grant funding, the Trust Territory Environmental Quality Protection Act (24 PNCA Chapter 2) and all regulations adopted pursuant thereto shall remain in effect and shall control in the event of any conflict with this chapter, subject, however, to the following exceptions:

(a) The Board shall replace and perform all duties of the district environmental protection advisory board as prescribed by 24 PNCA Chapter 2.

(b) The Trust Territory Environmental Protection Board may delegate any of its functions to the Board consistent with the requirements of the Federal Acts upon a finding by the Trust Territory Environmental Protection Board that such delegation will not jeopardize any grant of financial assistance. In the event that it finds that any such delegation results in the actual or threatened termination of any financial grant it may withdraw the delegation and resume performance of the function in question.

(c) Notwithstanding section 24 PNCA § 221, the Trust Territory Environmental Protection Board shall hold one regular meeting each year. Special meetings may be called by the chairman as deemed necessary.

# Movements of Effluents in Malakal Harbor and their Potential Effects on Local Coral Reefs

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## INTRODUCTION:

As the population of Palau increases, so must the size of the sewage treatment facilities. Currently the major sewage treatment plant is on Malakal Island and the effluent from this facility is released into the center of Malakal Harbor (see Figure 1) through two outlets at a depth of about 15 meters. There had been no previous attempt to determine how well this freshwater effluent mixes with the saline harbor water upon release, and there was no information available on how the effluent plume was moved and dispersed throughout the harbor (or seaward) by winds and tides. This study, therefore, was designed to answer the question of horizontal advection of the effluent plume during spring and neap tides, during the northeast trade wind season in February - March, and during the southwest monsoon season in September - October. We used a Seabird CTD probe to measure the vertical stratification in temperature and salinity. This enabled us to estimate the vertical mixing rate in the harbor as well as the dilution rate of the sewage effluent by the time it reaches the surface. Also, we tracked the actual movements of water in Malakal Harbor with curtain drogues set at various depths, and we simulated the movements of water and effluent via a computer simulation model. We collected preliminary observations on several of the nearby coral reefs to see if there was damage to the coral by sewage effluent.

The work reported on here deviated from the original proposal as follows:

1. Water currents in Llebuchel channel were not modeled mathematically because on arrival in Palau, Dr. Wolanski determined that these waters moved almost exclusively within the confines of the channels themselves, and that mathematical modeling of the channels would not be informative. Instead, he recommended that it was necessary only to measure current speeds and directions in these channels in relationship to tidal cycle. The results of these observations and their implications are included in this report.

2. We anticipated in our initial objectives that we might be able to predict the impact of nutrients on nearby coral reefs if in the future there were a doubling of discharged effluent. However, we made no observations in our survey that the effluents currently discharged into Malakal Harbor have damaged either the local or distant reefs. That is to say, we did not observe any correlation of reef damage with distance from the outfall. Without such a correlation it is not possible to predict if a doubling in the volume of discharged effluents would cause even more local damage or new damage at more distant sites, since no damage was observed in the first place. Obviously, doubling the volume of waste discharged into Malakal Harbor will double the nutrient load in the harbor in the vicinity of the outfall pipe. Excessive nutrients are never considered to be ecologically beneficial, but we cannot state at this time that the current nutrient

levels in the harbor are excessive or if doubling these levels would cause eutrophication in the harbor.

3. Because of the absence of observed damage by effluent to the Malakal Reef, we did not set up 12-15 permanent transects to assess future changes on the reefs. Instead, we conducted qualitative surveys of the flora and fauna on these reefs.

4. Sampling for nutrients along drogue tracks was conducted on one occasion. After only three hours, surface nutrient concentrations dropped to background levels, whereas deeper water samples (below about 10 meters) had not changed. Clearly, surface nutrients are removed very rapidly by phytoplankton (see Parsons *et al.*, 1977 and Jumars, 1993). This is also implied by nutrient concentration isopleths for Malakal Harbor constructed by Matson (1995), showing rapidly decreasing concentrations of nutrients with distance from the outfall. Further sampling for nutrients was deemed unnecessary.



# Malakal Harbor

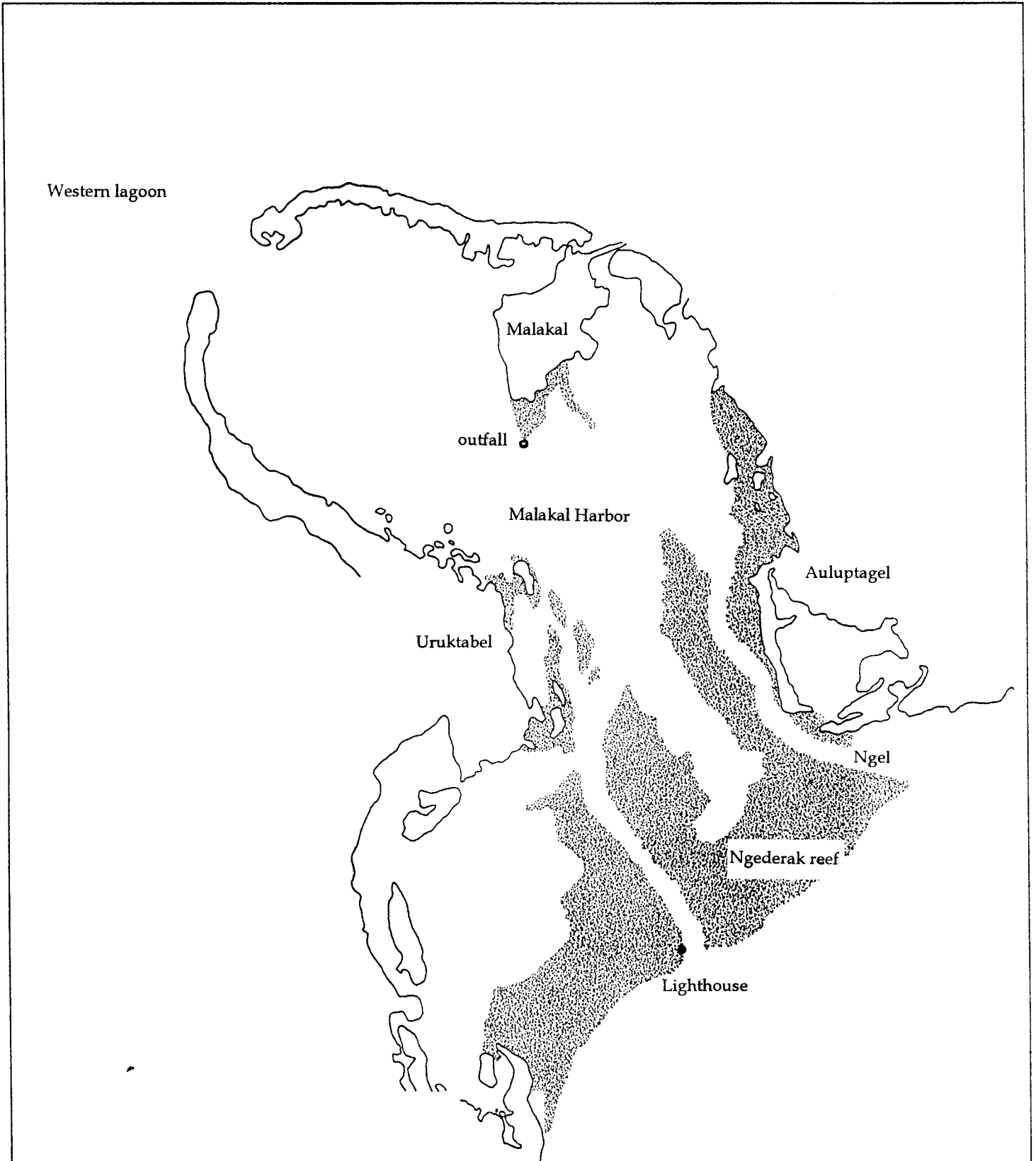


Figure 1

## DESCRIPTION OF DROGUE MOVEMENTS:

Water currents were tracked with curtain drogues in Malakal Harbor in February-March, 1996, during the northeast trade wind season and in September-October, 1996, during the period of southwest monsoons in order to assess the movement of sewage effluent throughout the tidal cycle of spring and neap tides. In all, 52 drogues were deployed and tracked for up to 8 hours at hourly intervals, at depths of 1, 8, and 18 meters, using GPS and a hand bearing compass for position location within the harbor. Drogue tracks for each of the following dates are plotted in Appendix 1.

**Feb. 20:** Three surface drogues were released off the sewage outfall approximately in the middle of Malakal Harbor. All 3 drogues drifted initially to the east with the ebbing tide, then south toward Lighthouse Channel. Of these 3 drogues, 2 drifted onto the top of the coral reef after several hours. The third drogue drifted almost to the mouth of the southeast channel, then, at 14:15, the tide changed, the drogue reversed direction, and 3 hours later it was once again in mid harbor near the site of initial deployment. During this 8.5 hr period it traveled approximately 9 km.

**Feb. 21:** Three drogues released in the northwest section of the harbor meandered slowly and variously to the northwest. After approximately 7 hours they had drifted about 1 km to the northwest entrance.

**Feb. 22:** Three drogues were released in mid harbor near the sewer outfall, but this time 1 each at the surface, 8 m, and 18 m. The surface drogue (D1) did not drift rapidly to the southeast as had the 3 surface drogues that were released at the same location two days earlier, but instead it meandered in the center of the harbor and it was recovered within 300 meters of the site of release 4 hours later. The 2 deeper drogues also moved slowly over this 4 hour period, drifting about 1 km to the southeast.

**Feb. 27:** Five drogues were released at the surface during a flood tide, 2 of these within the large ship anchorage area, 1 near the sewage outfall, and 2 in the mouth of the western entrance channel to Malakal Harbor. There was little movement of the drogues in the anchorage area. The drogue released near the sewer outfall was placed in the water only an hour and a half before high tide, and this drogue drifted slowly to the east and then to the south after the tide turned. The 2 drogues placed in the western opening to Malakal Harbor both moved rapidly to the northwest. They drifted so rapidly that we had to recover them early. A strong east wind was blowing, and there was a wind-driven surface current moving to the west. The presence of the wind-driven current was evidenced by a pronounced surface slick. The surface current and slick were generated near the mariculture facility on Malakal Island. The slick was visible as a surface

anomaly that extended northwest across Malakal Harbor and it was readily visible as it continued to the northwest in the western lagoon toward the western barrier reef.

**March 7:** Four drogues were deployed near the western entrance on an ebb tide. The 2 shallow drogues moved toward or through the western opening with the falling tide whereas the 2 deep drogues moved slowly, slightly over 1 km, to the east over the next 7 hours.

**September 13:** During the monsoon season 6 months later, 4 surface drogues were released in the southeast section of Malakal Harbor on a falling tide during a period of south-westerly winds blowing about 8-10 kts. Of these drogues, 2 moved rapidly to the southeast, 1 exiting through Ngel Channel and 1 through Lighthouse Channel into the open sea to the southeast. This last drogue moved rapidly away from the reef in a tidal jet, moving quite far seaward without deflection back toward the lighthouse. A third drogue moved due east of the release site, but it did not drift very far. The fourth drogue moved rapidly southeast until it became entangled with coral, whereon it was removed. The moderately strong south-westerly wind and the ebb spring tide produced the strongest currents that we measured in the southeast channels during the course of this investigation.

**September 17:** (Data not plotted) Four drogues were released in the late morning in the western entrance to the harbor, two at the surface and two at 12 meters depth. These were tracked for 6 hours, meandering extremely slowly just within the opening, moving less than 1 kilometer during this period, mostly to the southeast.

**September 19:** During an ebb tide followed by a brief flood, 4 drogues were released south of the outfall. Of these, 2 were at the surface, and 1 each at 8 m and 18 m depths. The 2 surface drogues moved to the southeast for 6 hours, the deep drogues moved slowly, and 1 of these (at 8 m) reversed direction when the tide changed. The 18 m drogue (to the north) also reversed direction, but this reversal occurred several hours before the tide turned, reflecting the presence of an eddy at that location.

**October 8:** We released 2 surface drogues and 2 at depth on a flood tide at the western opening to Malakal harbor. These all moved to the northwest into the western lagoon.

**October 9:** We released 6 surface drogues during flood tide near the western opening. These moved northwest and then directly north after exiting Malakal Harbor. We also deployed 1 surface drogue off the Malakal outfall on the flood tide, and it also drifted northwest.

**October 10:** We repeated the October 9th exercise near the western entrance but with 2 of the drogues at depth. Of these drogues, 3 moved very slowly to the west and 1 surface drogue moved very slowly to the south.

**October 14:** We tracked 5 drogues at the surface during an ebb-flood period, spacing the drogues more widely throughout the harbor. These drogues moved southeast during the ebb tide period. Then they turned north-northwest during the first 2 hours of flood tide.

**October 16:** We released surface drogues, 1 in the western entrance to Malakal Harbor and 1 further offshore in the western lagoon. The drogue at the harbor entrance meandered slowly within the entrance; the offshore drogue moved rapidly toward the north-northwest. The wind in the big lagoon was blowing at 9 knots from 165° and thus the lagoon drogue moved continuously downwind on a wind-generated current even though the tide changed during the middle of the run.

## CONDUCTIVITY-TEMPERATURE-DEPTH (CTD) DATA:

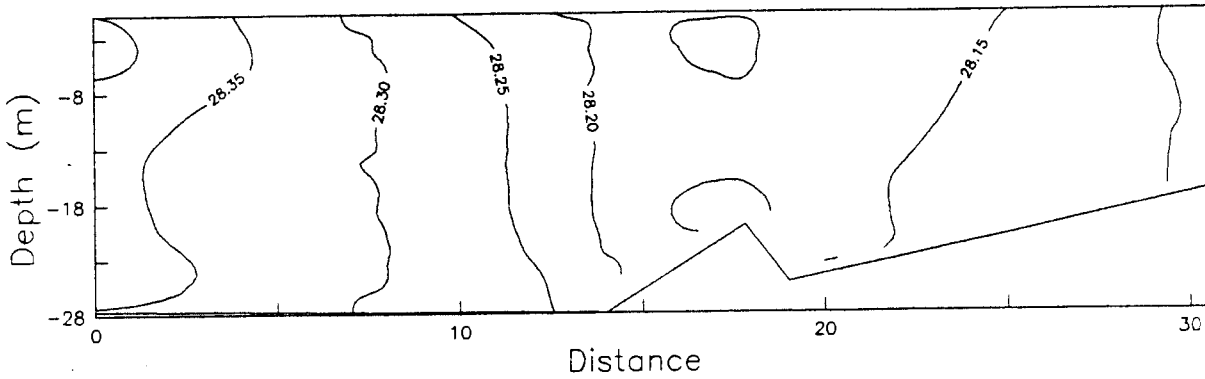
Vertical CTD profiles were collected during 4 days in February, 1996, at eight stations throughout Malakal Harbor, using a Sea-Bird CTD instrument accurate to 0.01° C and 0.01 ppt salinity. The vertical profiles demonstrated that the water column in Malakal Harbor was normally homogeneous and completely mixed from top to bottom. Oceanic water to the east was slightly cooler than the waters in the western lagoon by 0.2-0.3° C. Depending on the state of the tide, the vertical isotherms were variously compressed (see Figure 2). The salinity profiles showed the same pattern of complete vertical mixing (particularly on Feb. 21 and 22). Oceanic water from the east was slightly more saline than the water from the western lagoon, but there was only a 0.05 ppt difference between these water masses (see Figure 3).

On the night of Feb. 18, several inches of rain fell, leaving a relative fresh water lens at the surface. This lens was still detectable 4 days later. Little of this fresh water was flushed out of the harbor during the ebb tides. Instead most of this fresh water was mixed with deep water and the low-salinity lens was dispersed downward, primarily by turbulence.

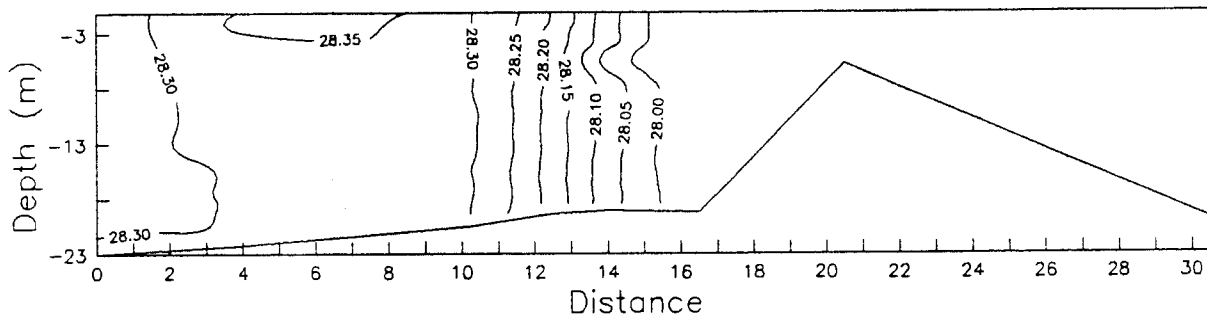
CTD vertical profiles were obtained directly within the effluent plume to assess the degree of immediate mixing of the freshwater plume due to nozzle turbulence and to turbulence generated as the less dense discharged water rose to the surface. Initial mixing due to these two processes reduced the initial concentration of the fresh water by more than 100 to 1 by the time the buoyant effluent (sewage effluent is fresh water) reached the surface (see Figure 4). Increasing the number of discharge openings, decreasing their size, and increasing the depth of the discharged water would significantly increase these initial mixing processes.

Notes on Figures 2 and 3: The temperature and salinity isopleths were derived from vertical temperature and salinity profiles taken at eight stations. The horizontal axes of the figures, labeled from 0 to 30, cover a distance of approximately 8km, starting from station 1 to the northwest (labeled "0") and ending at station 8 to the southeast (labeled "30"). Station 1 was about 200m outside the northwest opening of the harbor, in the waters of the western lagoon. From there, station 2 was at 0.6km, station 3 at 2.5km, station 4 at 3.3km (100m south of outfall), station 5 at 4.8km, station 6 at 5.2km, station 7 at 6.2km (within lighthouse channel), and station 8 at 8.0km, about 100m seaward of the mouth of the lighthouse in oceanic water. The bottom profiles indicated in the figures reflect the maximum sampling depths, not the bathymetry of the harbor. Temperatures are in degrees centigrade, salinity in parts per thousand.

February 20, 1996 Temperature Malakal Harbor



February 21, 1996 Temperature Malakal Harbor



February 22, 1996 Temperature Malakal harbor

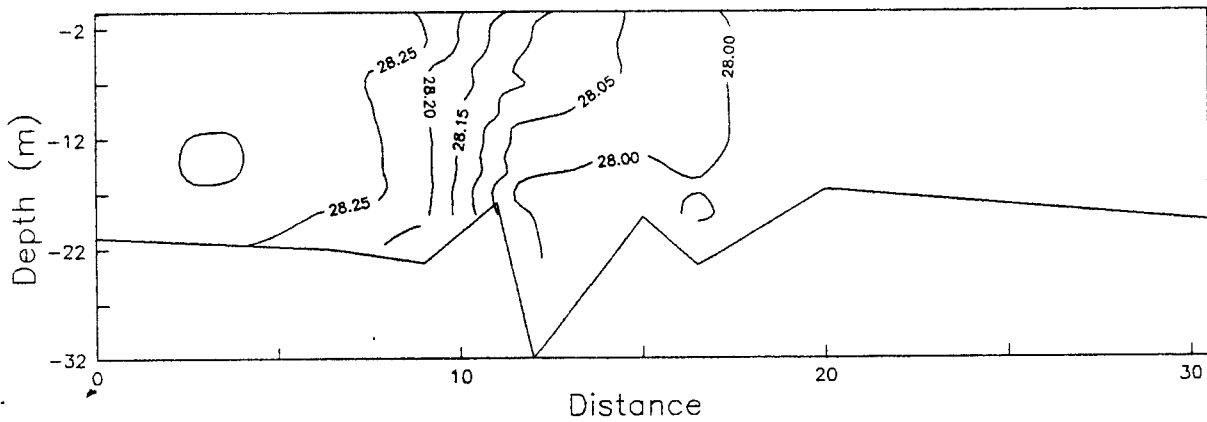


Figure 2

Salinity Malakal Harbor

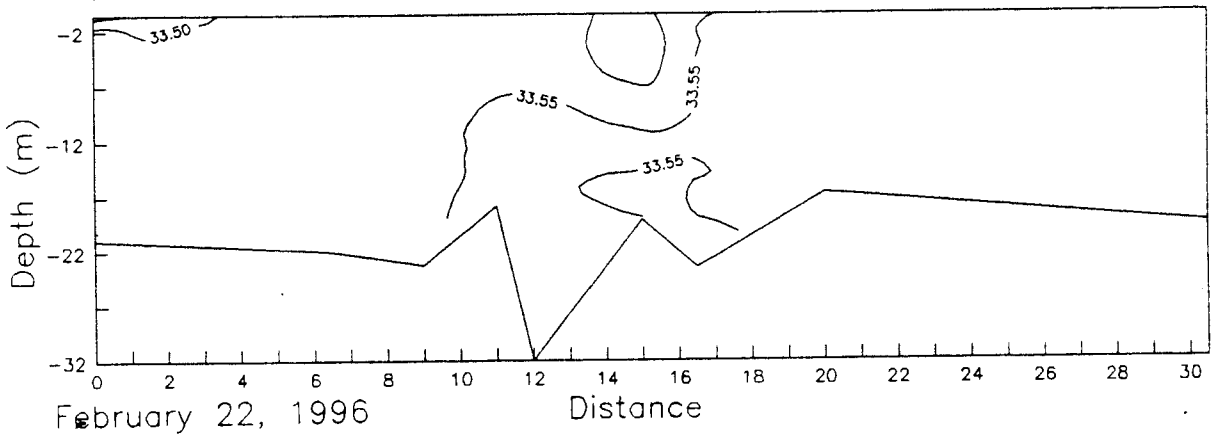
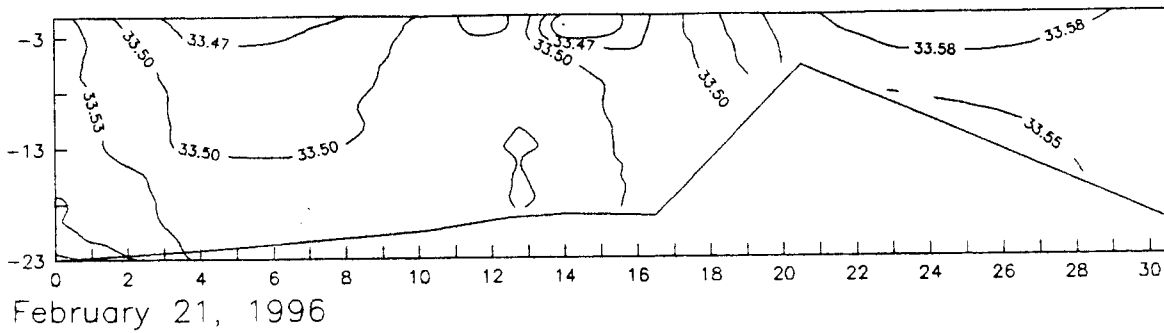
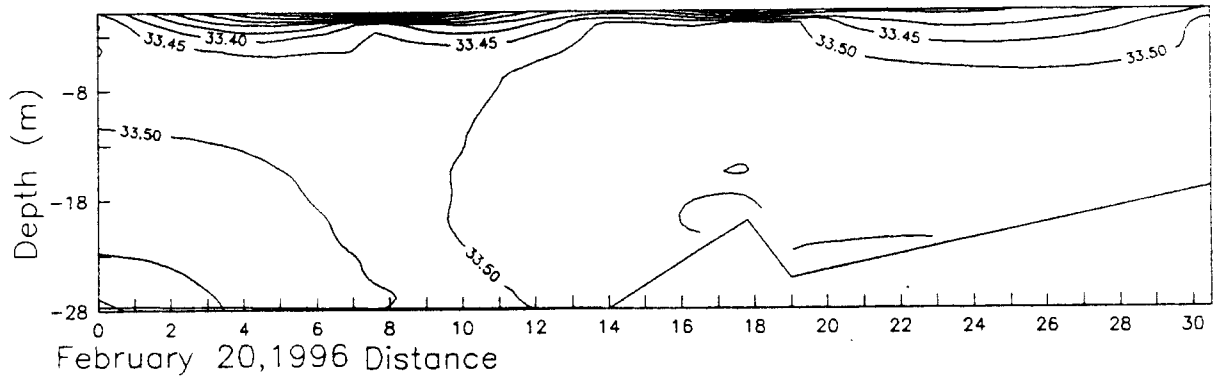


Figure 3

21.2.96 sewage plume Malakal harbor

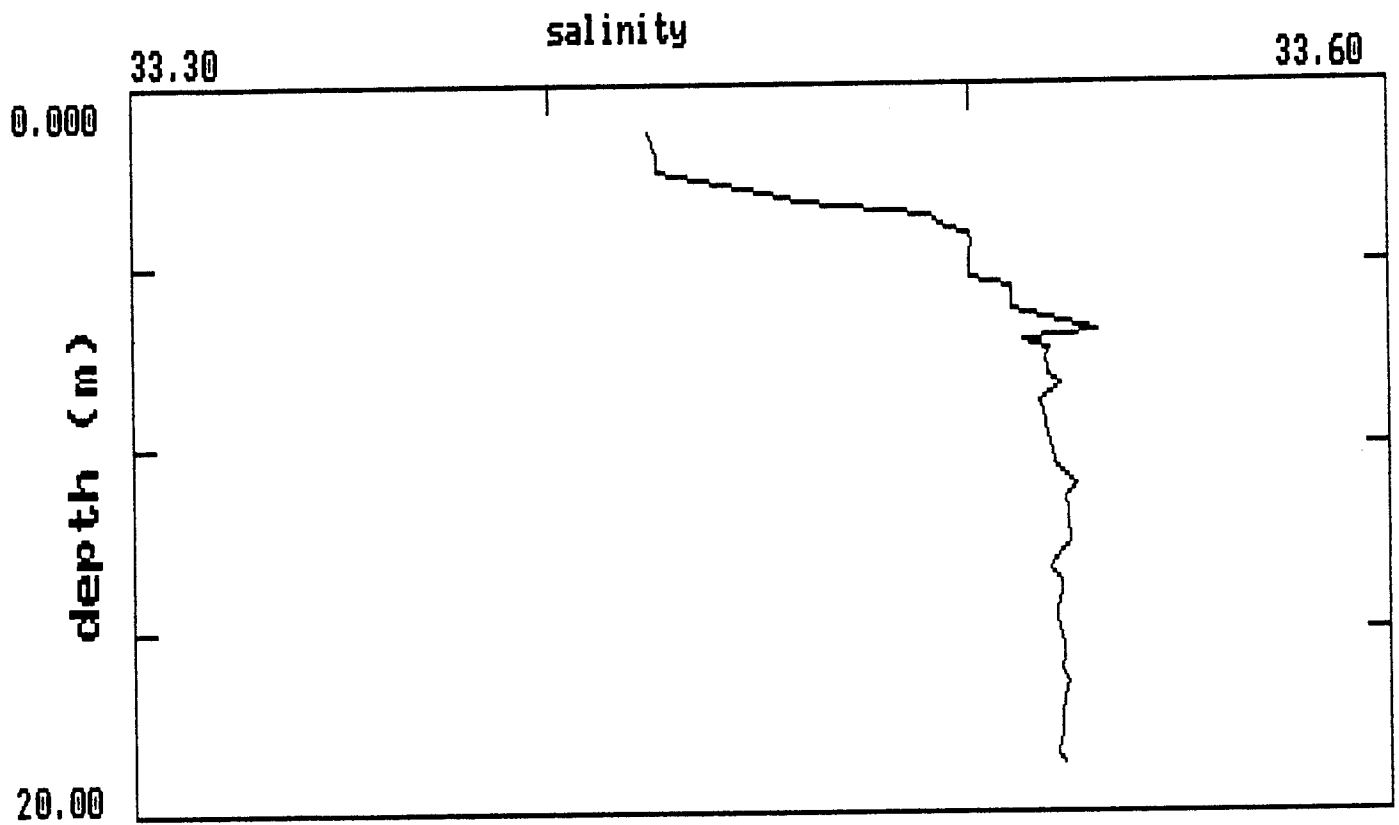


Figure 4



## MATHEMATICAL MODELING:

The field observations led to a number of estimates which are needed to decide on the type of mathematical model needed to model flow dynamics and the fate of effluent in Malakal Harbor. First, the CTD data over the outfall led to an estimate of jet mixing of the buoyant effluent of 100:1 from the outfall point underwater to the water surface. This mixing occurs in a time,  $t_1$ , less than 10 minutes (the theoretical time of rise of the effluent from the outfall to the surface); for practical purposes this mixing can be considered to be instantaneous.

The drogue data showed that over one semi-diurnal tidal cycle (12.4 hours) only occasionally did a drogue permanently leave Malakal Harbor, although tidal excursions are large at spring tides. There is no evidence from the field data of a net through flow (although some drogues did move out of Malakal Harbor into the western lagoon, they drifted very slowly), and thus flushing of Malakal Harbor occurs principally through tidal action. A tidal prism model shows that the mean residence time,  $t_2$ , is about several weeks.

The CTD data show that the vertical mixing time,  $t_3$ , is no more than 4 days. Thus we find that for Malakal harbor  $t_1 < t_3 < t_2$ . These same scaling laws are valid for the Great Barrier Reef (GBR) of Australia. As a result the GBR hydrodynamic model of Wolanski (1994) can be applied to model movements of the water and the fate of the effluent in Malakal Harbor. The model was 2-dimensional because the water column in the harbor was found to be completely mixed. Bathymetry used in the model (Figure 5) was extracted from navigation charts for Malakal Harbor. The grid size was 100 m. The model was run under conditions of no wind because the surrounding high islands and the shallow eastern reef effectively reduce the fetch to zero except during strong but infrequent westerlies. The model was forced by tidal elevations in the open sea and in the big lagoon; a small lag exists. The model output was current speed and velocity at each grid point and at regular time intervals, and the output was visualized using IBM Data Explorer for 72 hours at spring tides (see accompanying disk). Examples of the predicted currents are shown in Figures 6 and 7.

To study the fate of the effluent, a lagrangian advection-dispersion model was used. Dispersion was modeled using a random walk technique. Model effluent particles were entered into the harbor model at the site of the sewage outfall at a constant rate, coding the increasing concentration of particles from green, indicating lowest concentrations, through yellow (intermediate), to red, the highest concentrations. There was no provision in the model for uptake of nutrients by phytoplankton. Print-out samples of the predicted concentrations are shown in Figures 8 and 9.

When the model was run under spring tide conditions, the animated tidal movements of the effluent plume could be seen oscillating about the point of its entry into the harbor. Rapid currents on flood and ebb characterize flow in the southeast portion of Malakal Harbor, whereas there is significantly less flow into or out of the western entrance to Malakal Harbor. The central portion of the harbor is dominated by eddies of small size (less than 1 km diameter) and short duration (less than 2 hours). As concentration of particles builds, low levels of particles are ejected seaward to the southeast through the two channels, but most particles remain within Malakal Harbor during this 72 hour period. This is made apparent in the computer animation (on accompanying computer disk). There is comparatively little water movement in the vicinity of the commercial port to the east of Malakal Island. At neap tide conditions, the plume was less dispersed and even less flushed (not shown on the animation).

The mathematical simulation was used to evaluate flushing rate (or residence time) for Malakal Harbor. One thousand imaginary drogues were placed throughout the harbor and the model was run through successive tidal cycles until 50 percent of the drogues were lost to the western lagoon or to the open sea, most of them through the ship channel to the southeast. This run demonstrated a 50 percent flushing rate of harbor water approximately every 23 days.

## WATER MOVEMENTS IN MALAKAL HARBOR:

The movements of curtain drogues, CTD data, and the mathematical simulation model all demonstrate that effluent from the sewer follows three pathways. First, there is intense jet mixing as the effluent, being buoyant, rises from the outfall underwater to the surface. The effluent is mixed in the ratio 100:1; this may happen in less than 10 minutes; for practical purposes it is nearly instantaneous. Second, the effluent mixes downward due to intense tidal turbulence and vertical homogeneity occurs within 4 days. Third, the effluent is moved around Malakal Harbor by currents, which on spring tides are about 0.5 m/sec in the channels. The plume does not advect immediately into the open sea to the southeast nor does it discharge into the western lagoon. Instead these effluents are mixed and dispersed within Malakal Harbor. The effluent is flushed out highly diluted during ebb tides principally through the southeast channel. The mean flushing rate of the harbor is about 3 weeks.

Apparently, freshly discharged effluent, diluted already 100:1 by the time it reaches the surface, rarely moves rapidly enough to flush directly into the sea to the southeast. Instead this water returns to the center of Malakal Harbor on the succeeding flood, thereafter mixing in a series of intense but small-scale and short-lived gyres in the center of the harbor. Water in the deeper western basin of the harbor moves less rapidly but generally in the same direction as the water to the east; that is, toward the southeast during ebb tides and northwestward during the flood. This general circulation is illustrated in the simulation model. However, while most of the drogue tracks were consistent with the model, there was one drogue that moved contrary to this general pattern (i.e., to the west on the ebb), and several drogues in the vicinity of the opening that moved very little at all. The drogue tracks also suggest that the currents through the northwestern opening have both a shallow and a deep component. Although current velocities in the northwestern portion of the harbor are much slower than in the narrow channels to the east, the cross sectional area of the northwestern opening is large enough that substantial flushing into the western lagoon does occur. It is clear, however, that the magnitude of flushing to the western lagoon is much less than that to the ocean on the eastern side. We do not yet fully understand the dynamics of flow or the degree of flushing into the western lagoon. A complete investigation of circulation in the western lagoon might clarify some of our data for Malakal Harbor, but such a study was beyond the scope of the present investigation.

These findings are consistent with the results of Birkeland *et al.* (1976), who observed currents in the vicinity of the outfall off Malakal on January 8 and 9, 1976. Almost all drogues released at the outfall site (at both 1 and 5 m depth) moved to the northwest on the flood and to the southeast on the ebb.

Because of the characteristics described above, water in Malakal Harbor is not rapidly dispersed seaward or into the western lagoon, but instead it is mixed primarily by intense short-term, small-scale horizontal eddies within Malakal Harbor. Residence time of the water in the harbor is weeks to a month in duration, depending on presence of neap or spring tides, whereas nutrients are removed rapidly from the water column during daylight hours by phytoplankton from Malakal Harbor in 1 to 2 days (Parsons, *et al.* 1977; Jumars 1993). Particulate nutrients may also settle out as a result of flocculation, also within days (*ibid*). It is clear, therefore, that nutrient distributions and concentrations within the harbor are primarily a function of phytoplankton uptake rates, vertical settling of particles, and the long residence time of the water in the harbor, but not horizontal advection of the water itself. Nutrients in Malakal Harbor, therefore, are controlled by:

- 1) quantity of effluent discharged daily via treated sewage and via untreated waste from ships,
- 2) volume of water in the harbor,
- 3) flushing rate of the harbor,
- 4) uptake rate and concentration of phytoplankton,
- 5) vertical settling of particles and flocs, and
- 6) the depth and the size and number of openings at the ends the discharge pipes.

## HEALTH OF NEARBY CORAL REEFS:

Concern had been expressed publicly in Palau that the nutrient levels in Malakal Harbor were excessively high and that there was visible damage to local coral reefs due to algal overgrowth and smothering of coral because of these high levels of nutrients. Presumably, then, should the discharge rate of the sewage plant be doubled, damage to local coral reefs would be expected to increase commensurably. The coral reefs of primary concern are located to the north of the eastern lighthouse and along Ngel Channel. Corals are damaged or killed primarily by the following factors:

- 1) **sediments** and smothering from terrestrial runoff or dredging,
- 2) **overfishing** and overgrowth by algae due to elimination of herbivores,
- 3) **predators**, such as crown-of thorns starfish (*Acanthaster planci*),
- 4) **high nutrients**, causing overgrowth and exclusion by algae and sponges,
- 5) **cyclones**,
- 6) **boat anchor damage**.

We used SCUBA to examine 8 sites suggested by local biologists and fishermen as locations of potential coral reef damage due to excessively high nutrients from the sewage plant. At each location we assessed the relative importance of all six of the above hypotheses as these related to present and recent past community structure of the reef, not just the nutrient hypothesis. The reefs we examined are grouped below into three categories: those south of the lighthouse, those north of the lighthouse, and those along Ngel Channel.

We assessed the relative importance of the factors listed above by searching each area for evidence associated with each of the above hypotheses. For example:

1) Sediment damage is evidenced by the presence of sediments within the interstices of densely branched corals, by the presence of easily resuspended sediments when rubble is turned over, and by the absence of most species of sponges, tunicates and bryozoans, which are filter feeders. High energy environments prevent damage from sediments because of resuspension of fine particles.

2) Overfishing and subsequent overgrowth by algae because of an absence of herbivores is evidenced by the presence of large quantities of rapidly growing species of algae (such as filamentous green algae) and by absolute absence of herbivorous fish. Overfishing by spear fishermen is indicated by an absence of all fish large enough to spear (those greater than about 20-25 cm) and by the presence of recently killed tridacnid clams and broken shell fragments.

3) Recent crown-of-thorns starfish damage is evidenced by the presence of live *Acanthaster* and the presence of their fresh white feeding scars, whereas historical damage (during the

previous 10-30 years) due to crown-of-thorns can be assessed by the presence of dead coral branches or plates of their preferred food types (primarily species of *Acropora* corals) scattered as a uniform rubble field around isolated coral heads, with quantities of decaying coral decreasing with distance from the coral head. The coral heads will often still contain large and relatively old colonies of those species of coral that *Acanthaster* does not eat, such as fire coral, *Millipora* and *Tubipora*. Scattered across an *Acanthaster* damaged reef will be an occasional, large and quite old colony of healthy *Acropora*, because during an *Acanthaster* outbreak these starfish sometime do not find and kill all of their preferred prey. Colonies of species of large sponges will be present.

4) Excessive nutrients are demonstrated by the presence of rapidly growing algae, particularly by filamentous greens, but also by corals of all species decaying at equal rates and by fenestrated basement substrates, including those produced by coralline algae and molluscs. Encrusting sponges will be extremely abundant, with dominance by typically inshore species. Herbivores must be absent or at low population densities in order to permit high standing stocks of algae. Rubble fields composed of primarily a single species of dead coral around isolated coral heads will be absent.

5) Storm damage during typhoons can be determined by selective damage to those species of corals that are most brittle or most easily broken and rolled by large waves. In this case, the branching species of *Acropora* and *Millipora* will both show equal and extensive damage, the rubble fields will tend to be directional or asymmetric around isolated coral heads, and large, dead plate coral colonies will be displaced and usually upside down, often many meters from the coral head to which they had been previously attached. Damage is invariably greater in shallow water than in deep water. No large sponge colonies will be present.

6) Anchor damage is evidenced by isolated, overturned small coral heads, and by depressions within otherwise healthy coral colonies which are filled with coral rubble. Because anchored boats tend to hang into the wind, the rubble field caused by the relatively short anchor chain will be asymmetric and small.

### **Coral reefs south of Lighthouse Channel:**

These reefs are characterized by almost continuous coral cover, both live and dead, from 3 to 30 meters deep. There are large numbers of new coral colonies of 10 cm diameter or smaller everywhere, indicating that recruitment of new coral colonies is now occurring. We saw no large fish on these reefs but there were large numbers of individual fish smaller than about 20 cm in length, of all species (herbivores, predators, and planktivores). Many species of algae were present (including filamentous blue-greens), but none of the algal species were disproportionately abundant. There were intermediate sized (10-20 cm diameter) *Acanthaster*

present. Those present tended to be aggregated in groups of 2 to 5, scattered at distances of 10-20 m, and they were almost all feeding on large colonies of plate coral (*Acropora* sp. 1-2 m in diameter). Plate corals were not abundant and it was obvious that these will completely disappear from this area in several years at the current rate of predation by starfish. There were large rubble fields around some of the windward spurs to the reef, indicating prior damage by crown-of-thorns starfish many years previously.

These observations for the reefs south of the lighthouse are inconsistent with the ecological sequelae associated with anchor damage, typhoons, excessive nutrients, or smothering by sediments. The presence of live crown-of-thorns starfish confirm that there is current damage to the reef by coral predators that are feeding extensively on large plate coral. The existence of old coral rubble fields is consistent with the hypothesis that this reef was also damaged in past years by crown-of-thorns starfish. There is strong evidence now of overfishing by spear fishermen, as indicated by the total absence of large fish. Small fish are diverse and abundant, including large numbers of juvenile herbivorous fish, and there is no excessive algal growth. We conclude that current and past coral predators have changed the composition of these reefs, and that spear fishermen are overfishing the reef.

### **Coral reefs north of Lighthouse Channel:**

At depths below about 30 feet, the coral reefs north of lighthouse have intermittent coral heads surrounded by coarse carbonate sands. Many of these coral heads are small (< 3 m in diameter) and they rise only 3-5 m above the bottom. The heads are rounded and mostly devoid of mature *Acropora* colonies, although new recruits (10-20 cm diameter) of a wide variety of coral species are present. The smoothed upper surfaces of the coral heads are dominated by large sponge colonies, fire corals, and soft corals. There are rubble fields of large decomposing plate corals directly below these coral heads, and many of these plates are not overturned but rest on edge or lie right side upward. These plate corals are often covered with dead segments of branching *Acropora*, with dead segments extending around the coral heads and out over the white sandy bottom, which is composed of coarse sand, devoid of silt. We did not see crown-of-thorns starfish on these reefs. Species diversity of fish was high, but all the fish seen were less than about 20 cm in length. Coralline algae (*Halimeda* sp.) and an unidentified encrusting sponge dominated the surfaces of the decomposing *Acropora* segments. Occasional large colonies of live healthy *Acropora* were found, but these colonies all were located as isolates surrounded by large areas of clean sand. There were broken *Tridacna* shells amid the rubble. These observations are consistent with only 2 of the 6 hypotheses noted above, and we conclude that there has been severe damage in the past here due to predation by *Acanthaster* coupled with subsequent overfishing of herbivorous fish by spear fishermen.

### **Coral reef along Ngel channel and near the sewer outfall:**

The coral reef along the north side of Ngel Channel appears superficially to be devoid of living coral and covered exclusively by the macrophyte *Padina*. Yet beneath the blades of this broadleaf alga there is extensive live coral growth of many species of coral. These colonies are mostly encrusting forms, growing atop solid carbonate substrate composed of recently cemented *Acropora* rubble. In many places there are small colonies (20-30 cm high) of branching *Acropora*. Grazing reef fish are extremely abundant at the mouth of Ngel channel, where *Padina* is absent, and grazing fish are present but in reduced numbers further west along the channel where *Padina* is extremely abundant. There are no colonies of large sponges in this area, and no fine sediments. There are occasional solitary large *Acanthaster* present on top of these reefs. At the edges of the channel there are old, healthy colonies of fire coral, *Tubastrea*, and large individual sponges. These observations are consistent with the hypothesis of damage in the past by crown-of-thorns starfish, rapid coverage of the reef surface by a species of relatively unpalatable algae, *Padina*, and subsequent slow recruitment and slow growth of coral beneath the *Padina* canopy.

The coral reefs closest to the sewage outfall, such as the reef next to the Palau Mariculture Demonstration Center and the reef immediately adjacent to the sewer outfall, did not suffer damage by *Acanthaster* during the 1980 outbreak, and these coral areas perhaps are the healthiest and contain the largest number of coral species found anywhere in Malakal Harbor. These areas were surveyed both before installation of the sewer outfall (Birkeland *et al.*, 1976) and 18 years later (Birkeland *et al.*, no date).



## CONCLUSIONS:

1. Effluent from the sewage outfall reaches the eastern coral reefs near lighthouse only after many weeks due to the high residence time of water (about 23 days) in Malakal Harbor. The water reaching the eastern coral reefs has low nutrient levels because of strong jet mixing near the outfall, high vertical mixing rates within the lagoon due to tidally forced bottom friction, and because of tidally forced strong horizontal mixing by large numbers of small-scale and short-lived but intense topographically generated eddies. During this period of mixing within the lagoon, nutrients are rapidly assimilated by phytoplankton (within days of discharge). On those few occasions when a spring tide is coincident with a strong westerly wind, some relatively undiluted nutrients may escape to the east through Lighthouse Channel, but these are ejected away from the reef by the accompanying tidal jet.

2. All of the coral reefs surveyed have extensive loose or cemented rubble fields of dead *Acropora*, large numbers of new coral recruits, and large populations of juvenile herbivorous fishes, consistent with the ecological sequelae that follow major *Acanthaster* outbreaks when exacerbated by extensive overfishing of herbivorous fishes by spear fishermen. There is no evidence anywhere that we looked in Malakal Harbor of extensive damage to the reefs by high levels of nutrients, typhoons, terrestrial sediments, or boat anchors.

3. Nutrient hot spots in Malakal Harbor could be reduced immediately by adding additional diffusers to the end of the sewage outfall and by extending the end of the outfall pipe into deeper water. Ultimately, with continued increase in the volume of waste discharges, nutrient loads in Malakal Harbor will increase to the point where persistent phytoplankton blooms will reduce water quality and water clarity. Water clarity could be monitored via regularly scheduled Secchi disc measurements. The site of discharge of sewage might then be moved to a deeper location outside of the barrier reef.

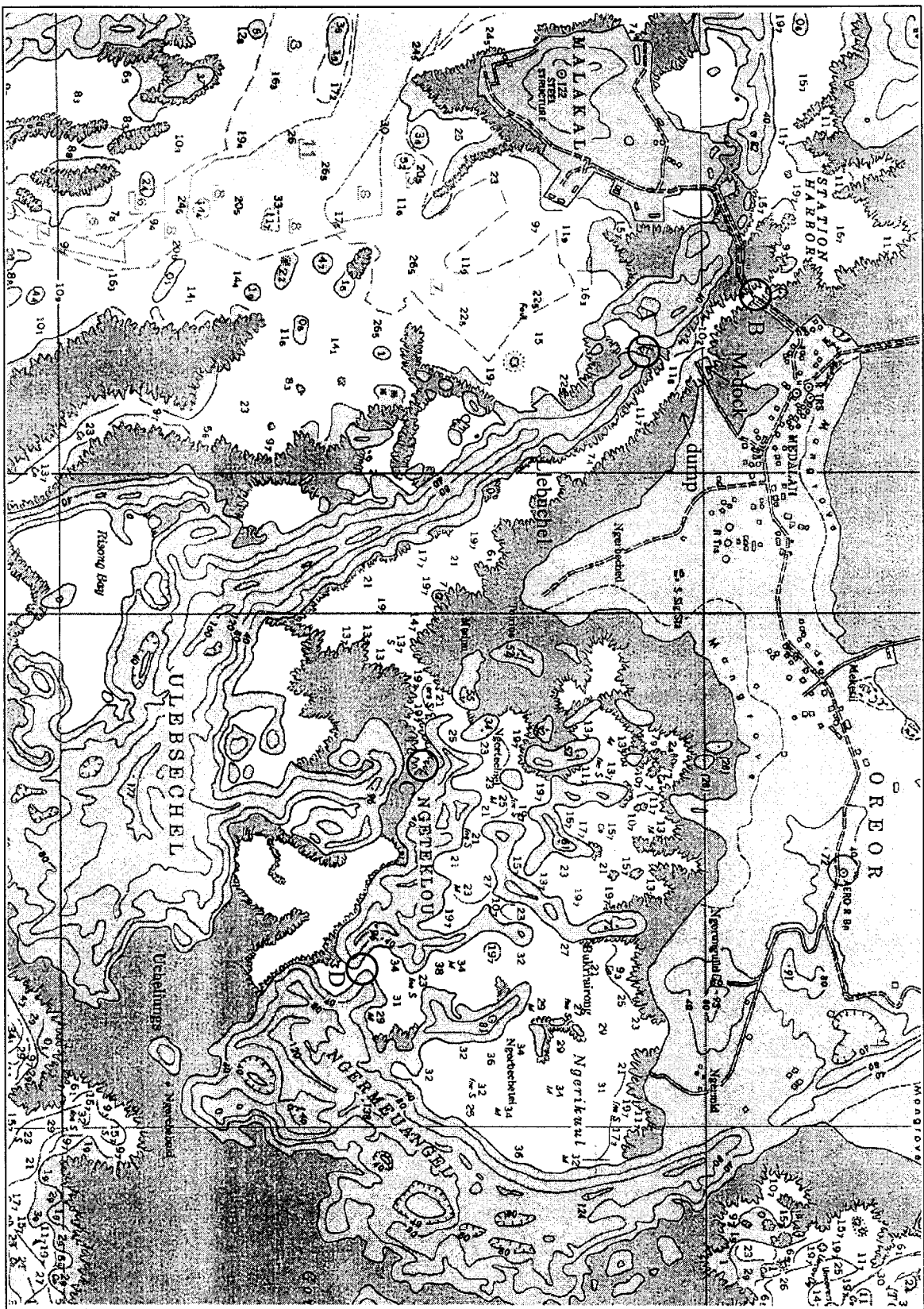
## LLEBUCHEL AND IWAYAMA BAY:

Llebuchel is a channel that runs between the islands of Koror and Ulebsechel, and connects the western lagoon and the eastern open sea via Ngerikuul, or Iwayama Bay, which is a maze of waterways among a group of small limestone islands (see Figure 10). The dump site for Koror is located right on the water near M-dock on the northeast side of Llebuchel. Because of the proximity of the dump to this waterway, there is concern over the fate of liquid and solid pollutants that enter Llebuchel from the dump.

In 1968 a study was undertaken to describe the water circulation and assess the extent of pollution in the Llebuchel area (Hardy and Hardy, 1972). At that time the public dump was only one of several pollutant sources of concern in the area, the others being untreated sewage from the nearby residential area and public hospital. In order to further describe the water circulation through Llebuchel and Iwayama Bay, the results of that study were supplemented here by a limited number of observations during 1996 and 1997 of current direction and speed at several locations in the water system.

The results of the 1968 study are summarized here (from Hardy and Hardy, 1972): Iwayama Bay was defined as the body of water bounded by the four points marked as A, B, C, and D in Figure 10. Opening A, which is a man-made cut, connects Llebuchel with Malakal Harbor. Opening B connects Llebuchel with the western lagoon. Openings C and D connect Llebuchel and Iwayama Bay, respectively, with the open sea via Ngerchelonga, which is a stretch of two to three kilometers of mostly shallow reef. The cross sectional areas of the channels at openings A, B, C, and D were estimated at 92, 980, 1300, and 293 m<sup>2</sup>, respectively. Total surface area of the bay was estimated at 6.4 million m<sup>2</sup>, and total volume at 40.2 million m<sup>3</sup>. Water currents were observed only on falling tides, during which it was found that water flowed out of the bay through all four openings. By measuring ebbing current velocities in the channels at those four points, the volume of water lost through each opening during a single ebb cycle was estimated. This was done during spring, neap, and moderate tidal phases in February, 1968. It was found that approximately three percent (0.21m tidal fall during neap) to 22 percent (1.52m tidal fall during spring) of the bay's water was flushed during a single tidal cycle. Most was found to drain through opening B, followed by D, A, and C. The proportion draining through each opening was found to vary depending on the point in the spring-neap cycle. For example, 77 percent of the drained water flowed through the western openings A and B during spring conditions, compared to only 40 percent during neap conditions. During moderate conditions, about 50 percent drained to the west and 50 percent to the east. Also measured were fecal coliform bacteria levels in the shallow areas surrounding M-dock in the vicinity of two untreated sewage outfalls (since removed). Coliform levels in the shallow reef area from west of M-dock

# Liebuechel and Ngerikuul (Iwayama Bay)



Soundings in meters. Reprinted from chart number 81151 of the Defense Mapping Agency, *Arangel Channel and Koror Road* (1966), from data up to 1969. Notable changes since 1969 include landfill at the dump and a channel across the reef from the dock at Ngerkedam village in Ngerbeched out to Liebuechel.

Figure 10

to Ngerbeched dock were found to be very high, particularly near the two outfalls. Concentrations decreased with increasing distance from the outfalls, but sampling was limited to an area within only about one kilometer of the outfalls, so it is difficult to gauge just how rapidly concentrations decreased with increasing distance from the outfalls. Finally, coliform concentrations over the reef were, in general, found to be much greater at low tide than at high tide.

Current observations made during March and April, 1996 and January 1997 revealed a few more details on the dynamics of circulation in the Llebuchel system. On a given day, currents were observed at approximately one hour intervals for four to eight hours at points A, B, C, and D and some intermediate points. At each observation, a shallow curtain drogue was tracked for one to three minutes, and current direction and approximate speed were recorded. Those observations are shown in Appendix 2.

In general, water was found to flow into the bay through all four openings during rising tides, and out of the bay through all four openings on falling tides. Thus there are one or more nodal points within the bay that experience no currents, effectively dividing the system into two or more tidal watersheds. Because of the complexity of the system, there are likely to be many such points. There is one major split in the water system, formed by Ngeteklou island. The passage to the southwest of the island is the more direct, but shallow, route between Llebuchel and the sea. The passage to the north comprises the innermost portion of the bay. Nodal points were identified on both sides of the Ngeteklou, the northern one apparently actually a series of points. These points were found to migrate considerably with tidal phase. Not enough data were available to determine the precise effects of tidal phase on node location. The problem is complicated because the location of the points is probably dependent on both the semidiurnal (rise--fall) and semi-monthly (spring-neap) rhythms (as indicated by the results of the 1968 study), and possibly on wind effects, as well.

Slack current occurred at each of the four openings of the bay at slightly different times, but again, there were not enough data to determine just what the tidal lags were or how they varied with the neap-spring cycle. One of the few observed examples was at the top of a spring tide on January 9, 1997, when the current turned out through A before turning out through B, C, and D, suggesting that the tidal phase was more advanced in Malakal Harbor relative to the western lagoon and Ngerchelngael to the east.

The 1968 study estimated that about three percent of the bay is flushed during a typical six-hour neap tidal cycle, 22 percent during a typical spring cycle, and 11 percent during a typical moderate cycle. If 100 percent of the flushed water were replaced with new water on the flood, and if instantaneous and complete mixing within the system occurred, the 11 percent figure would indicate a residence time of about three days (the length of time spent in the bay by an

average parcel of water). But such complete exchange and mixing do not occur, and much of the water in the innermost bay certainly spends much longer than three days before being drained to the lagoon or ocean. This is confirmed by casual observations of water clarity in the inner bay. The water there is considerably more obscure, because nutrients originating from land (and perhaps from point sources) remain relatively concentrated due to slow flushing with nutrient-poor oceanic water, allowing the phytoplankton biomass to achieve relatively high levels. A parcel of water near the dump, on the other hand, being so close to the western openings, is likely to spend less time in the system before being flushed out and replaced with nutrient-poor water. This does not mean that water and pollutants originating at the dump will not reach the inner bay and spend considerable amounts of time there. They certainly will; it is a matter of degree.

Typical current speeds throughout the system are illustrated in Appendix 2. Observations were never made during the most extreme tidal falls or rises, so currents undoubtedly reach higher speeds than those reported here. The fastest currents were observed in the narrow channels at openings A and B, often exceeding 50 meters per minute. Currents in the narrow channel at opening D were never observed to exceed 25 m/min. Currents at opening C, with the largest cross-sectional area, were slower yet. Currents in the main channel near the dump are fast enough that something entering the channel on an ebb tide is very likely to exit via openings A or B within a couple of hours even during neap conditions. If something enters the channel on a flood tide, it is capable of traveling well into the bay within a single flood cycle.

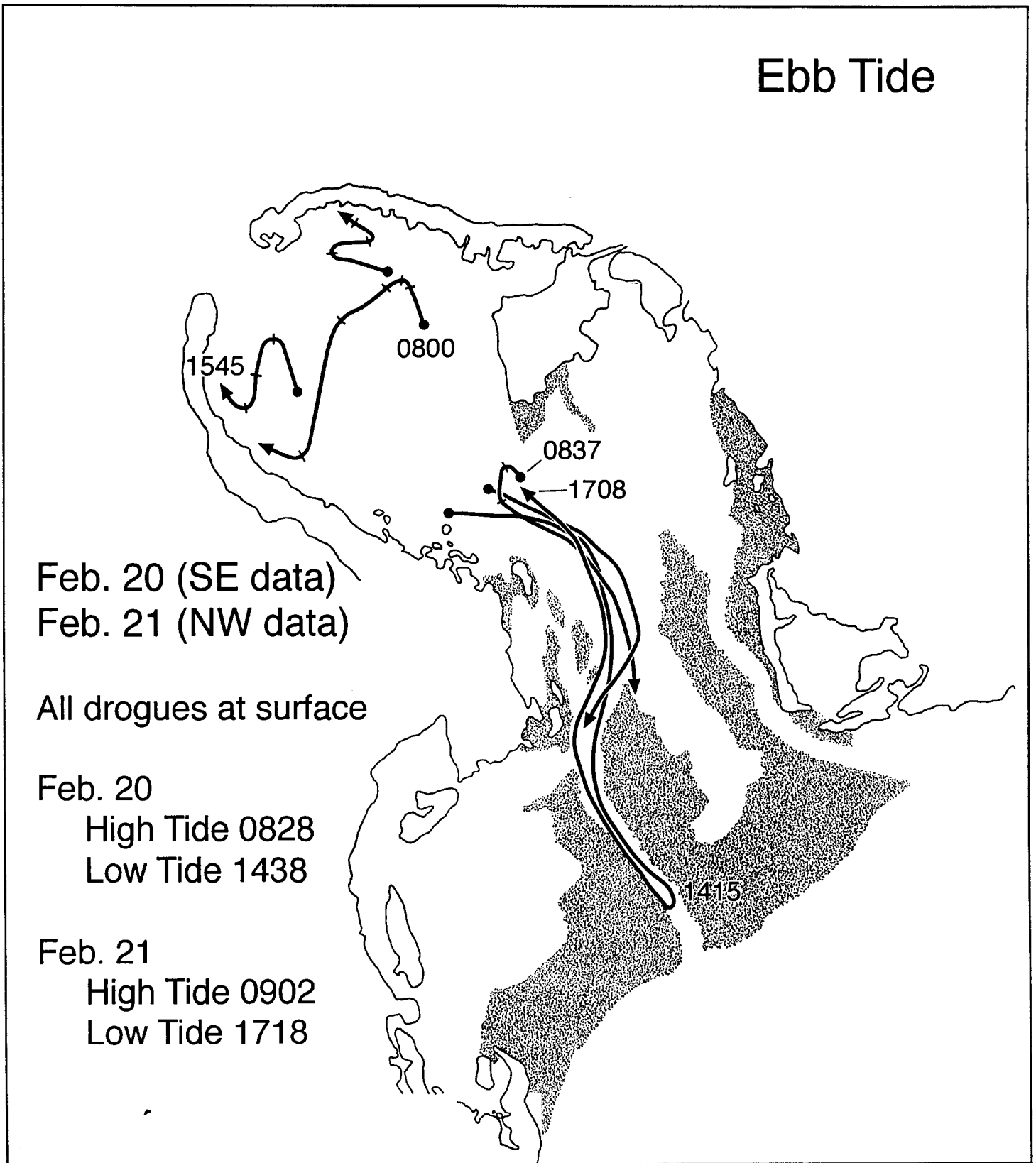
Concentration at a given location in the bay of a point-source pollutant originating in the bay is a function of: 1) rate of input of pollutant, 2) rate of removal within the bay, 3) rate of removal by flushing, and 4) the dynamics of advection and mixing that determine the distribution of the pollutant within the bay. The first, rate of pollutant input, is of course a function of the operation and maintenance of the dump or other source. The second, removal of pollutants within the water system, can occur through biological means (e.g., uptake of nutrients by phytoplankton, consumption of bacteria by filter-feeders), burial in sediments, and chemical breakdown. Further discussion of these two factors--pollutant input and removal processes--is beyond the scope of this study. The last two factors, flushing and advection and mixing processes, were addressed to a limited extent in this study. Average residence time of water in the bay or in any subsection of the bay is a measure of how quickly a pollutant will be flushed from the system. No quantitative estimates of residence time were made here, but observations of currents confirmed that residence time varies widely within the bay system. Waters near any of the four openings are likely to spend the least time in the system (probably minutes to days). Waters near the nodal points in the innermost portions of the bay are likely to spend the most time in the system (probably days to months). Thus, pollutant concentrations within the system are highly dependent on both the location of the pollutant source and the location of interest. The current

dump site, being near both of the western openings, is in about the best position possible within the system to take advantage of flushing. On the other hand, portions of the Llebuchel-Iwayama Bay system have what are undoubtedly some of the highest residence times of any marine waters in Palau. Using the criterion of residence time apart from any other considerations, the Llebuchel-Iwayama Bay system is clearly one of the least desirable locations for sources of potentially deleterious pollutants.

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APPENDIX 1. PLOTS OF DROGUE TRACKS



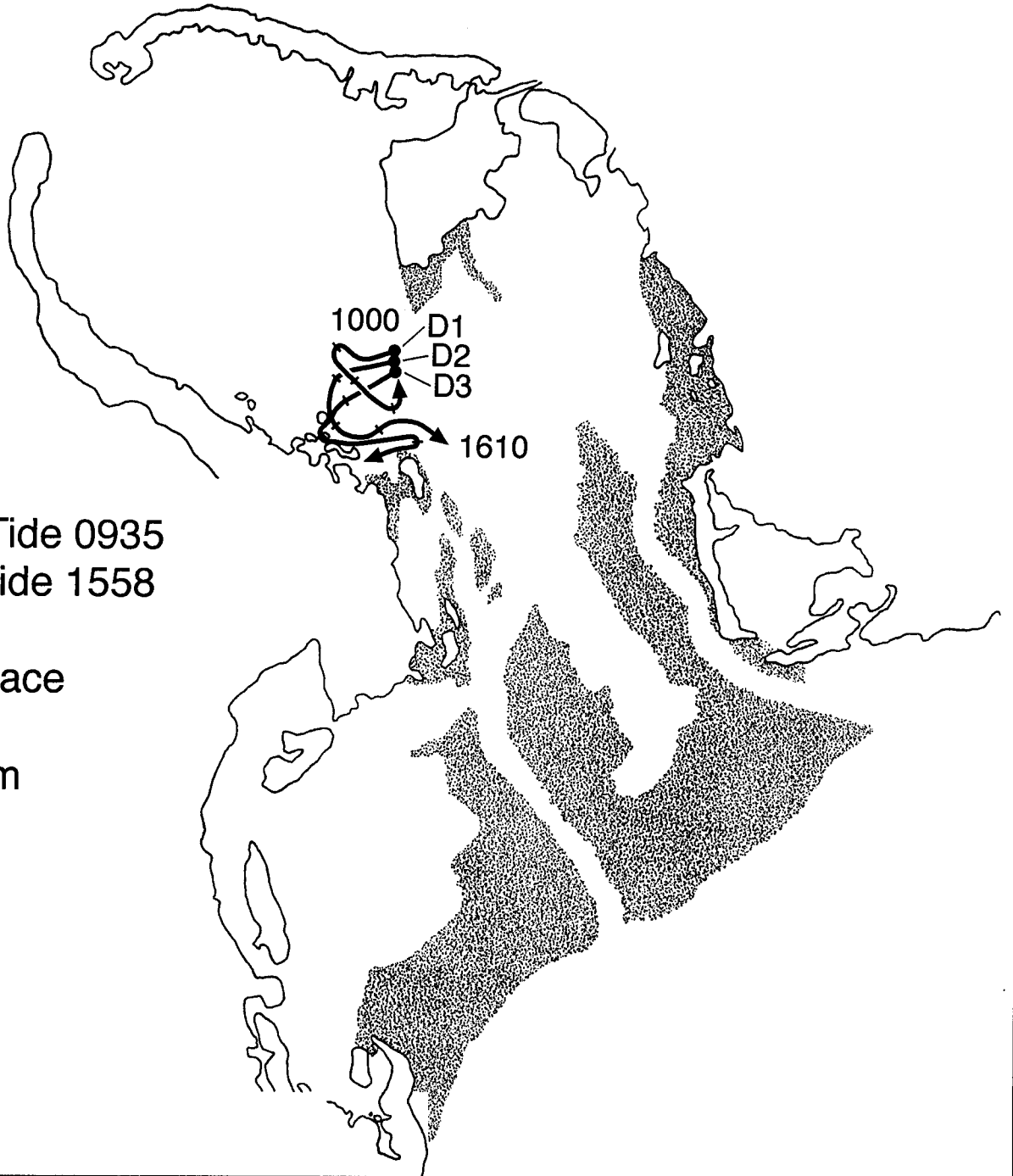


# Ebb Tide

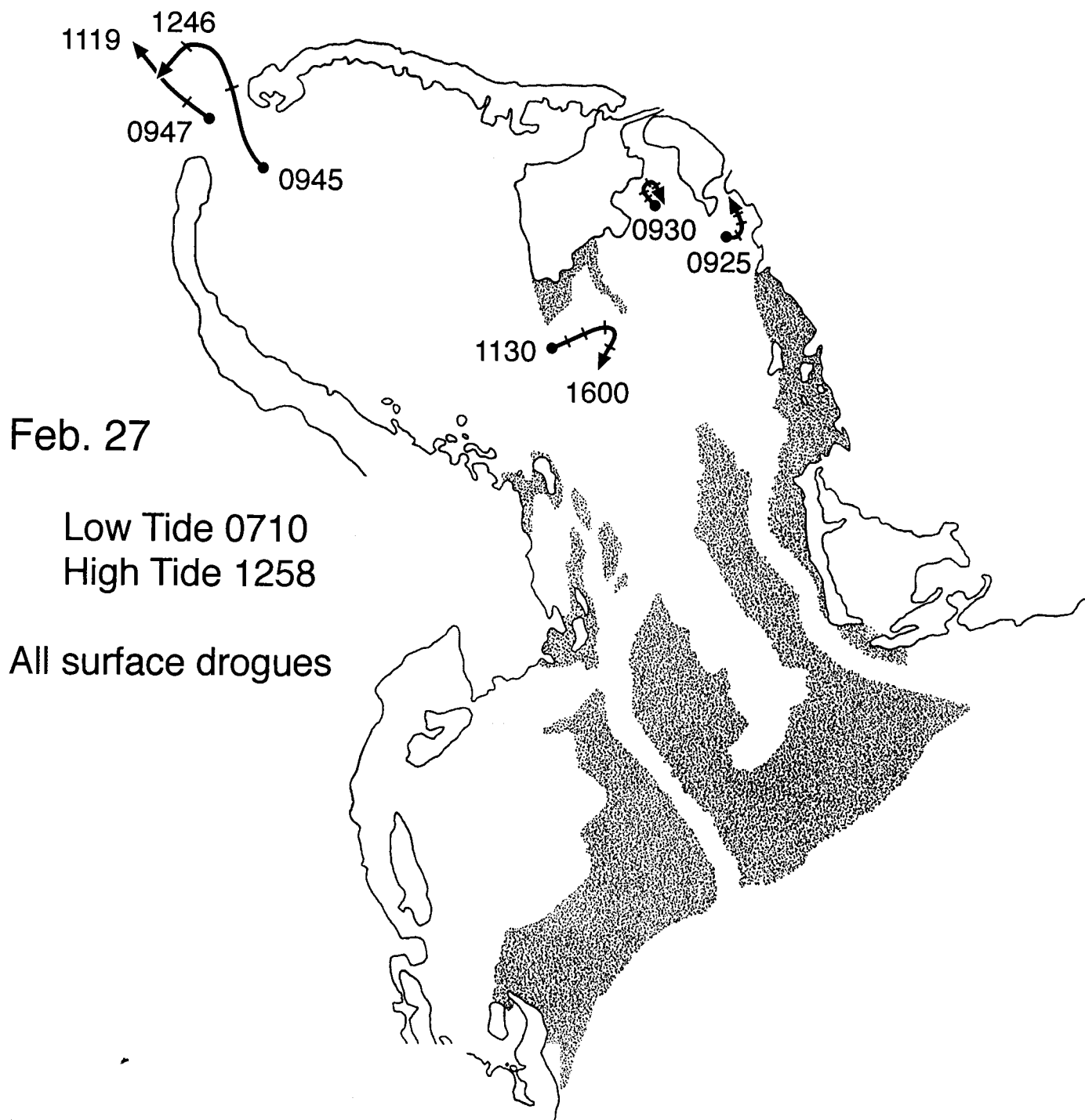
Feb. 22

High Tide 0935  
Low Tide 1558

D1 = surface  
D2 = 8 m  
D3 = 18 m



# Flood Tide



# Ebb Tide

Shallow (#3)

Shallow (#1)

Deep (#2)

0855

Deep (#4)

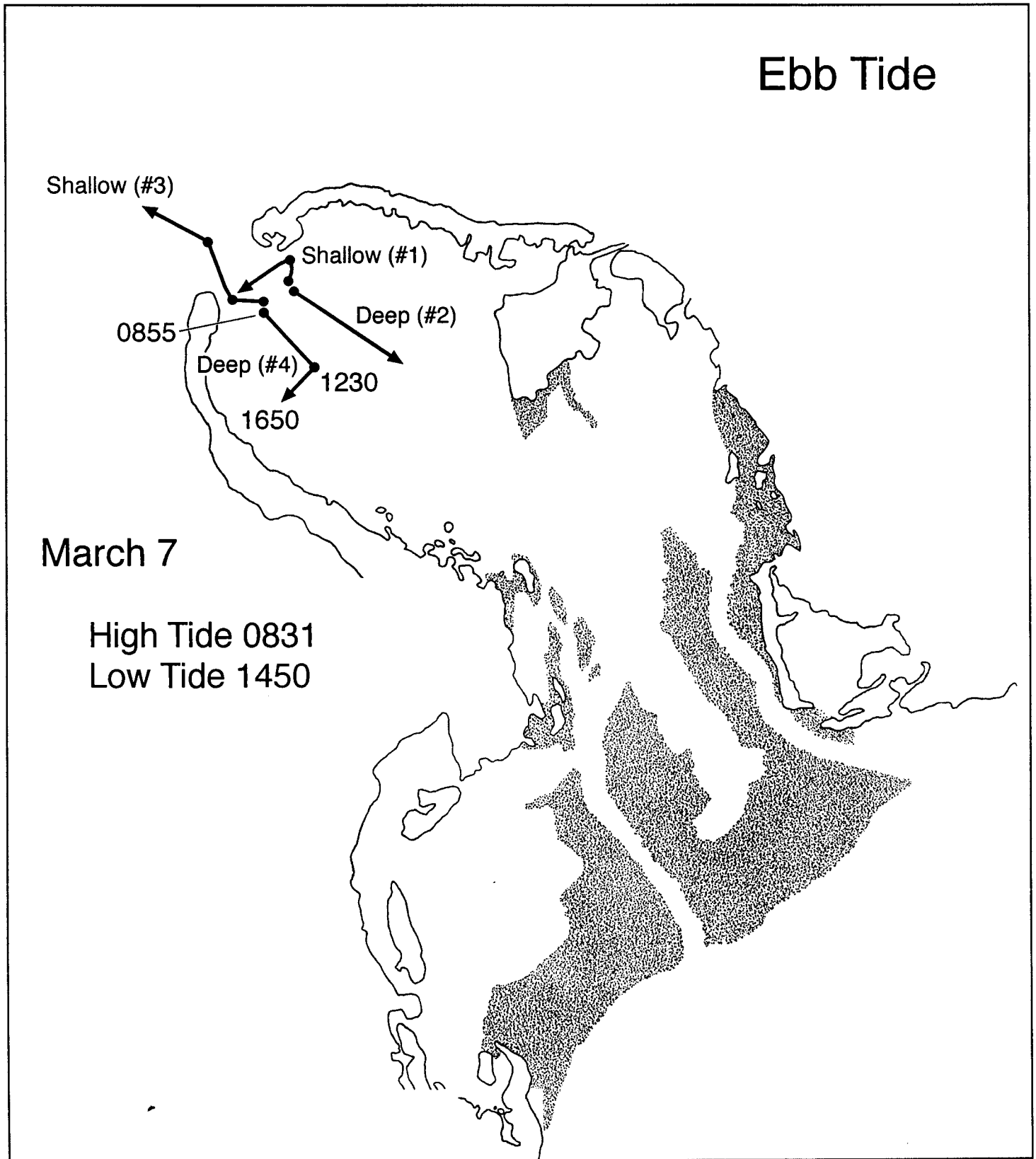
1230

1650

March 7

High Tide 0831

Low Tide 1450

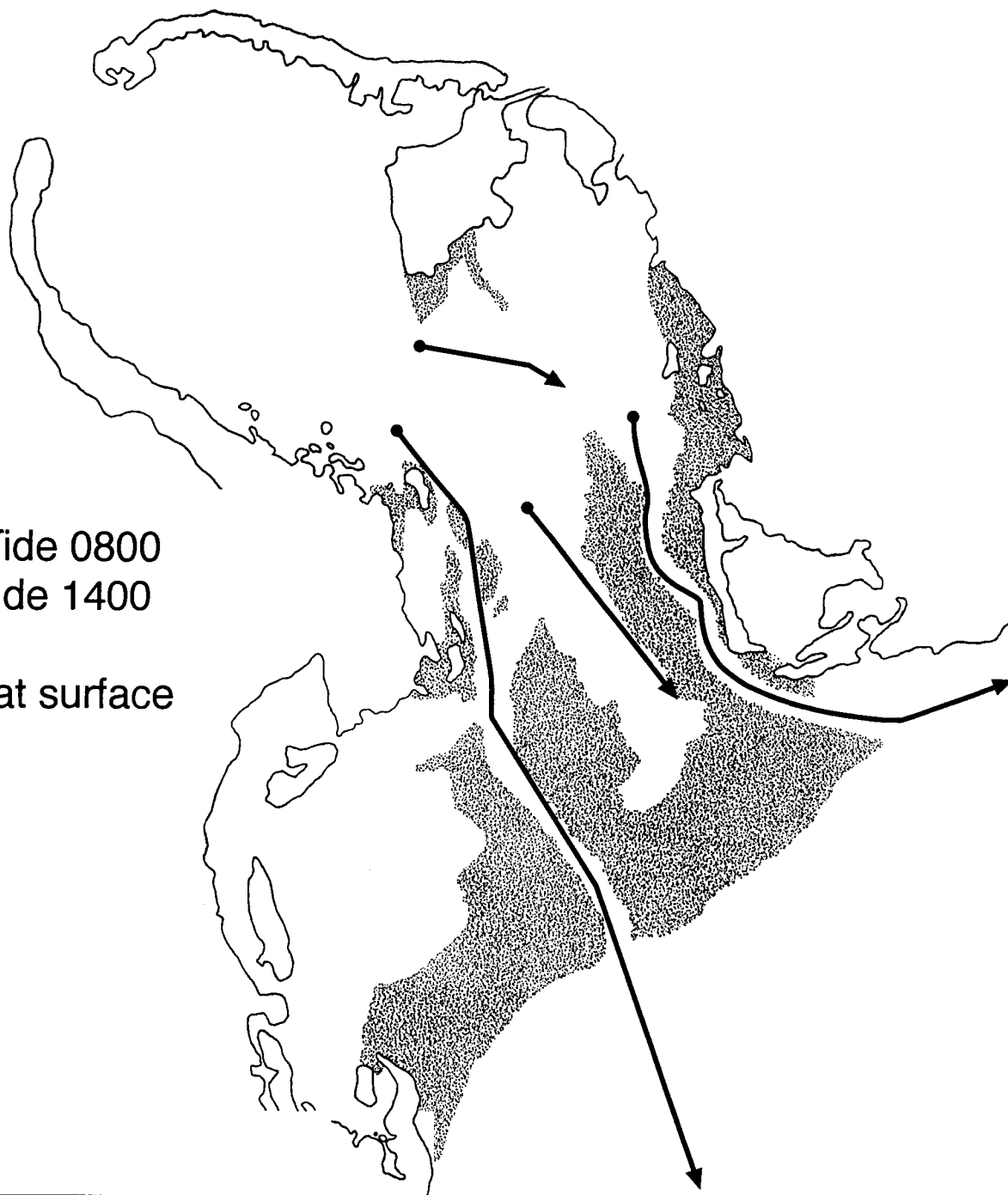


Ebb Tide

Sept. 13

High Tide 0800  
Low Tide 1400

Drogues at surface



# Ebb-Flood Tide

Sept. 19

Wind speed average 7.8 knots

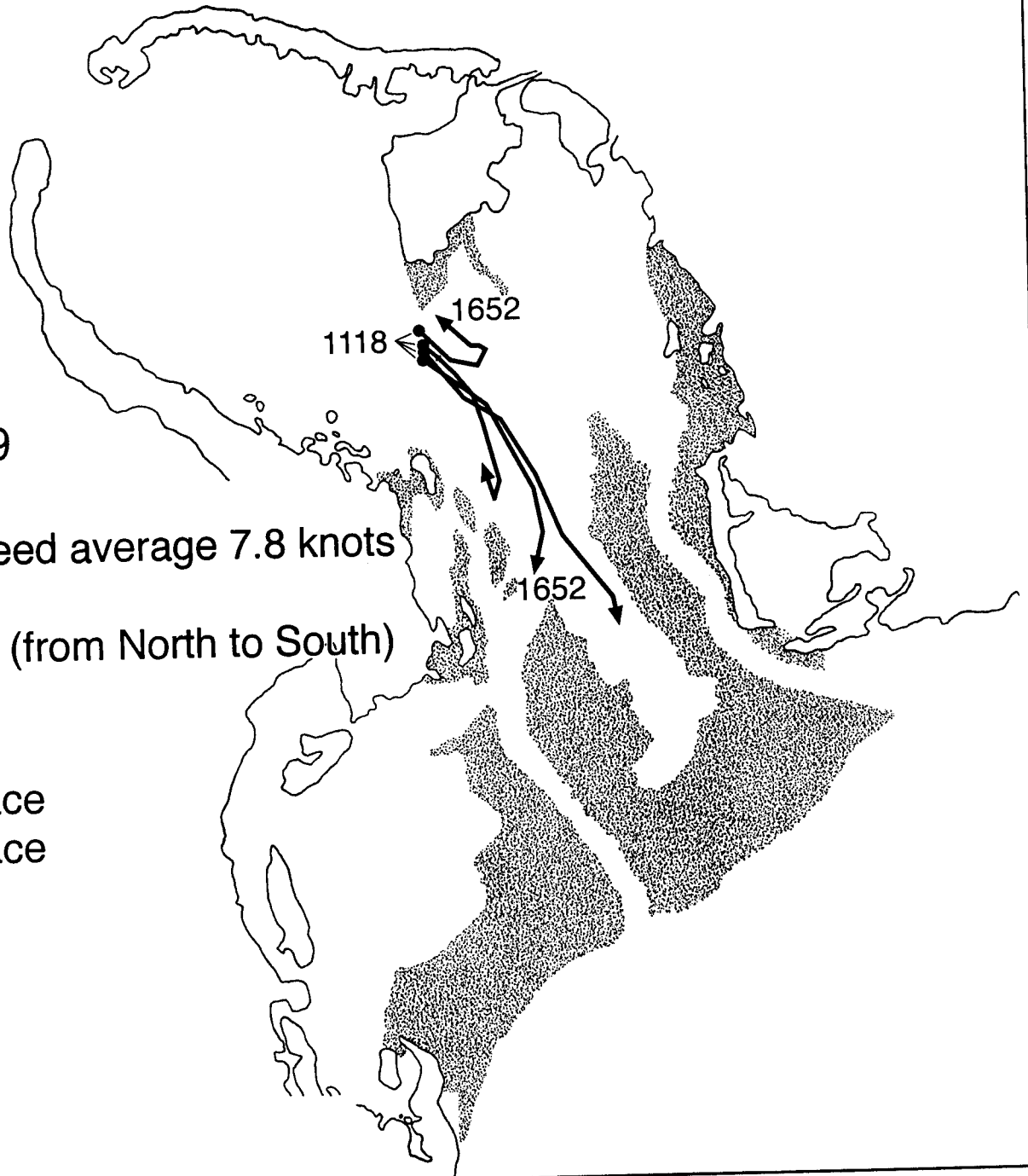
Drogues (from North to South)

18 m

8 m

Surface

Surface



Flood Tide

1620

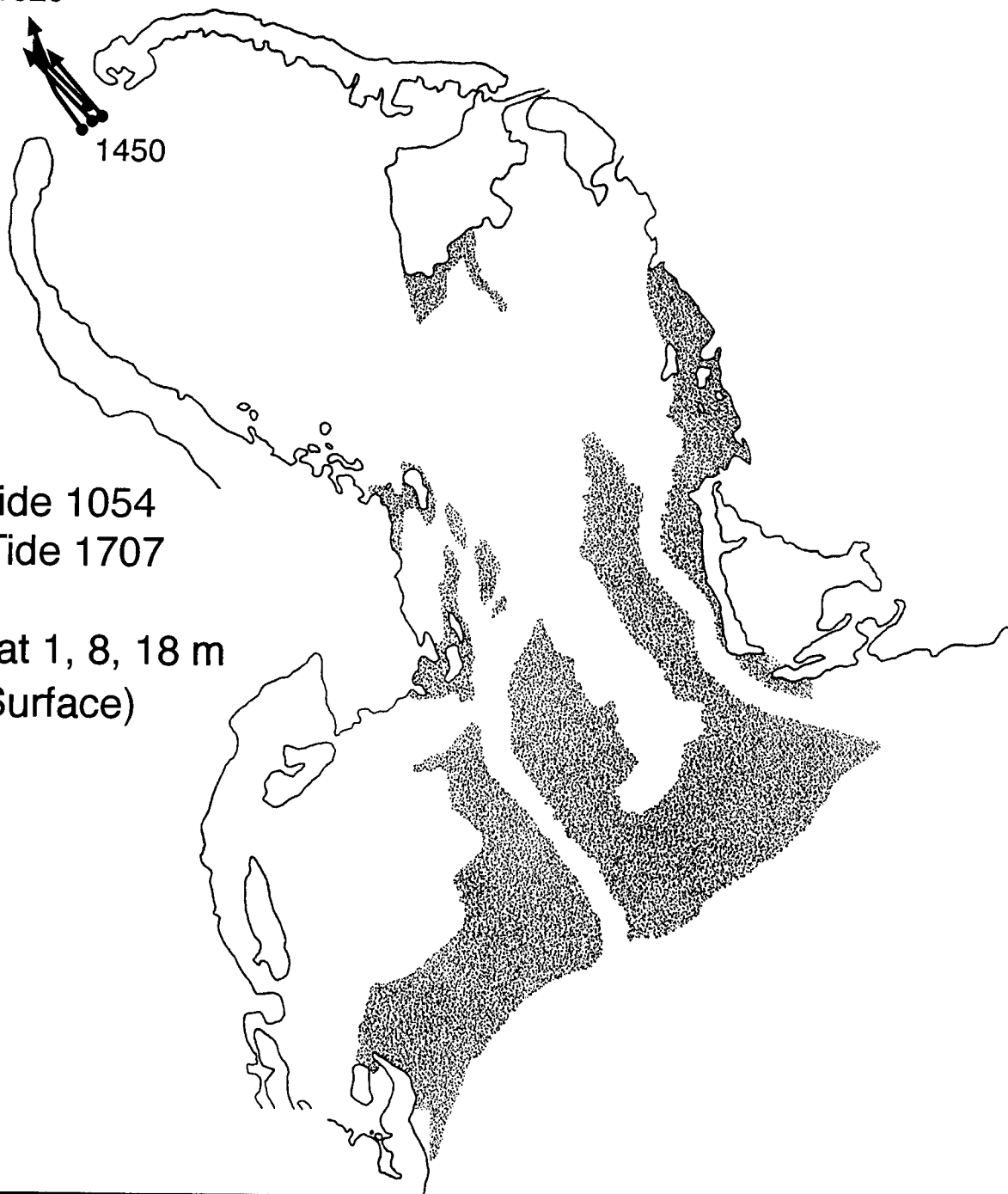


1450

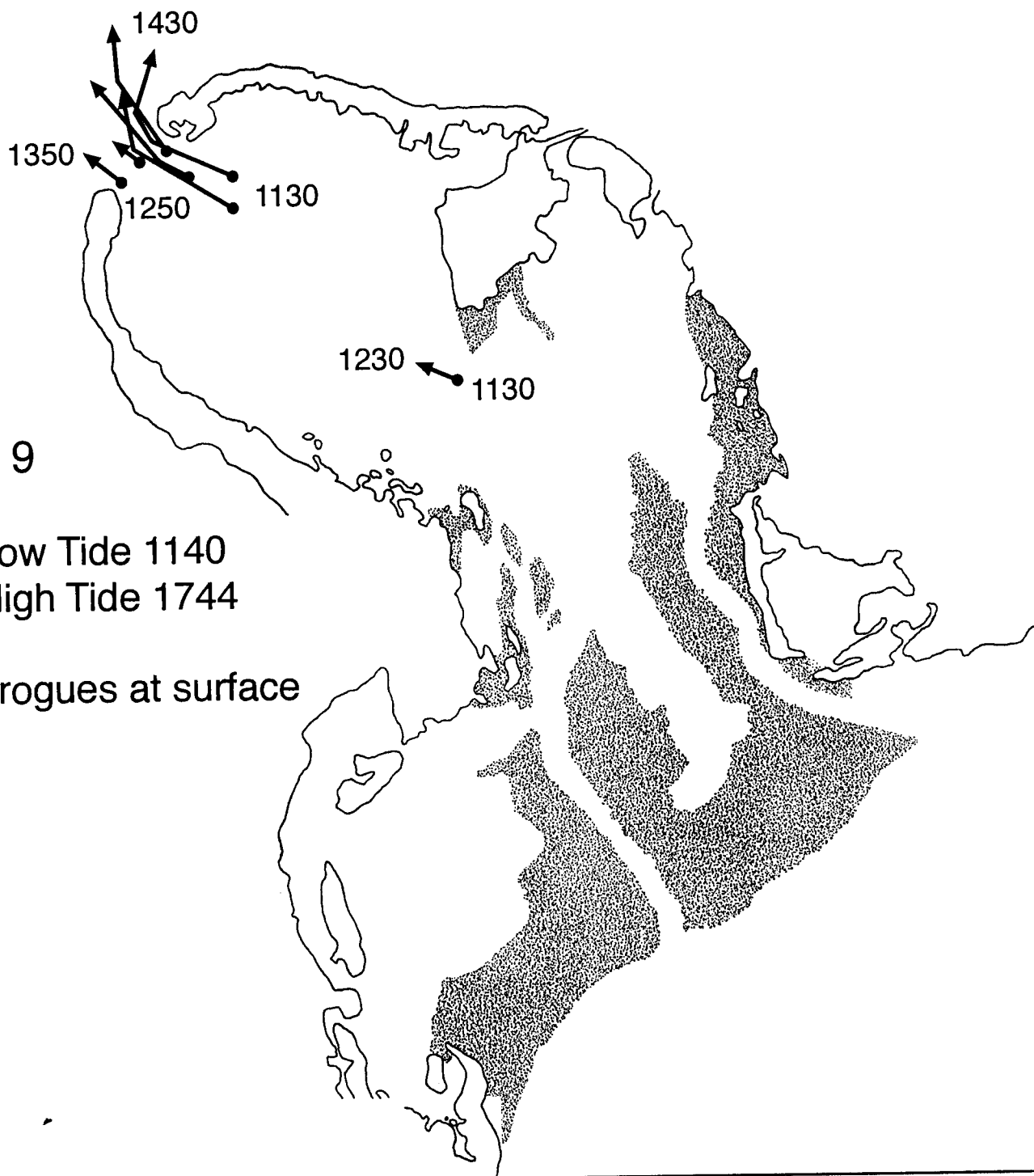
Oct. 8

Low Tide 1054  
High Tide 1707

Drogues at 1, 8, 18 m  
(2 at Surface)



# Flood Tide

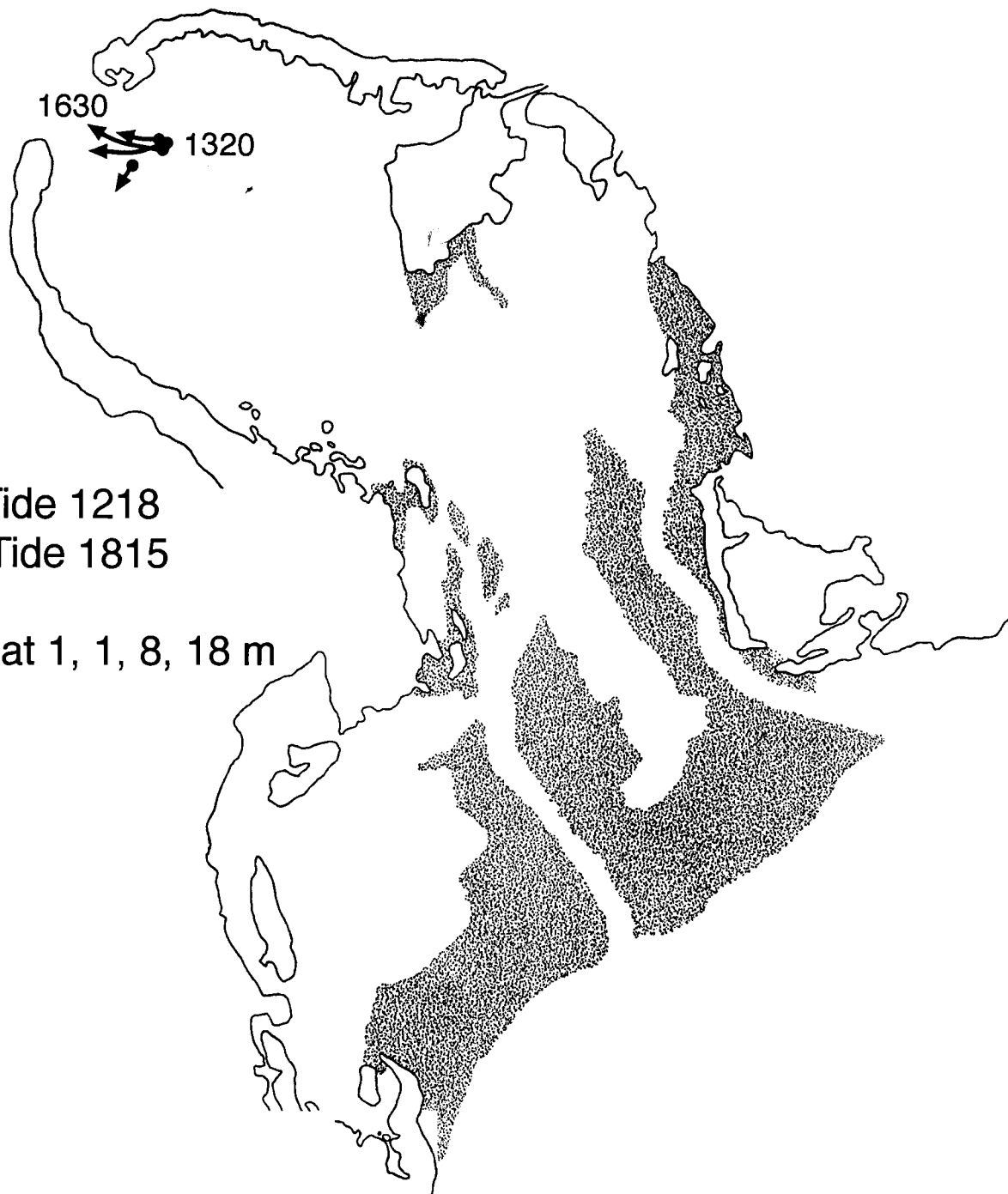


Oct. 9

Low Tide 1140  
High Tide 1744

All drogues at surface

# Flood Tide



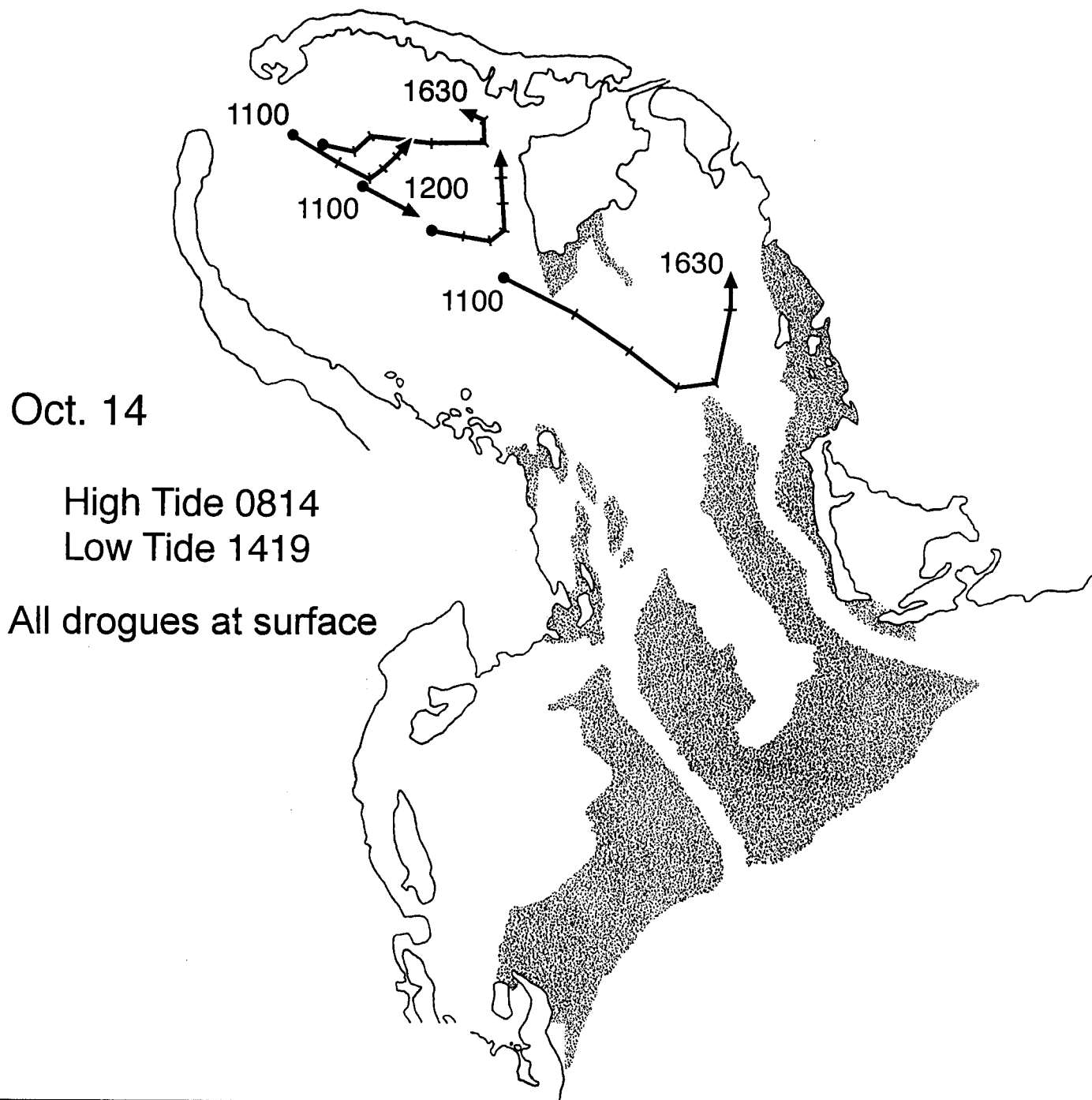
Oct. 10

Low Tide 1218  
High Tide 1815

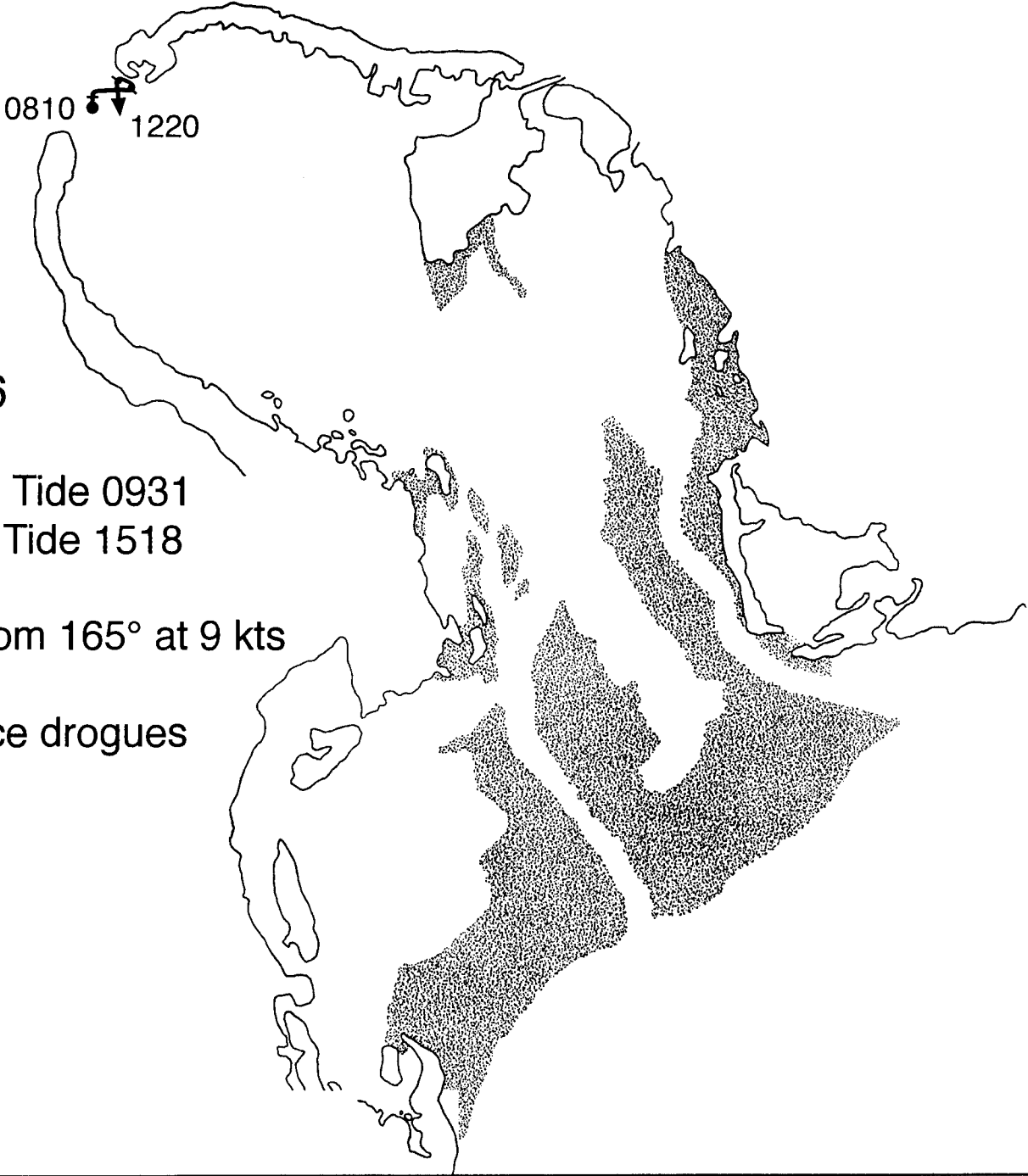
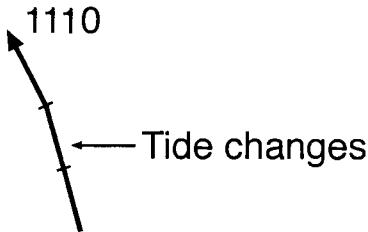
Drogues at 1, 1, 8, 18 m



# Ebb then Flood Tide



# Flood to Ebb Tide



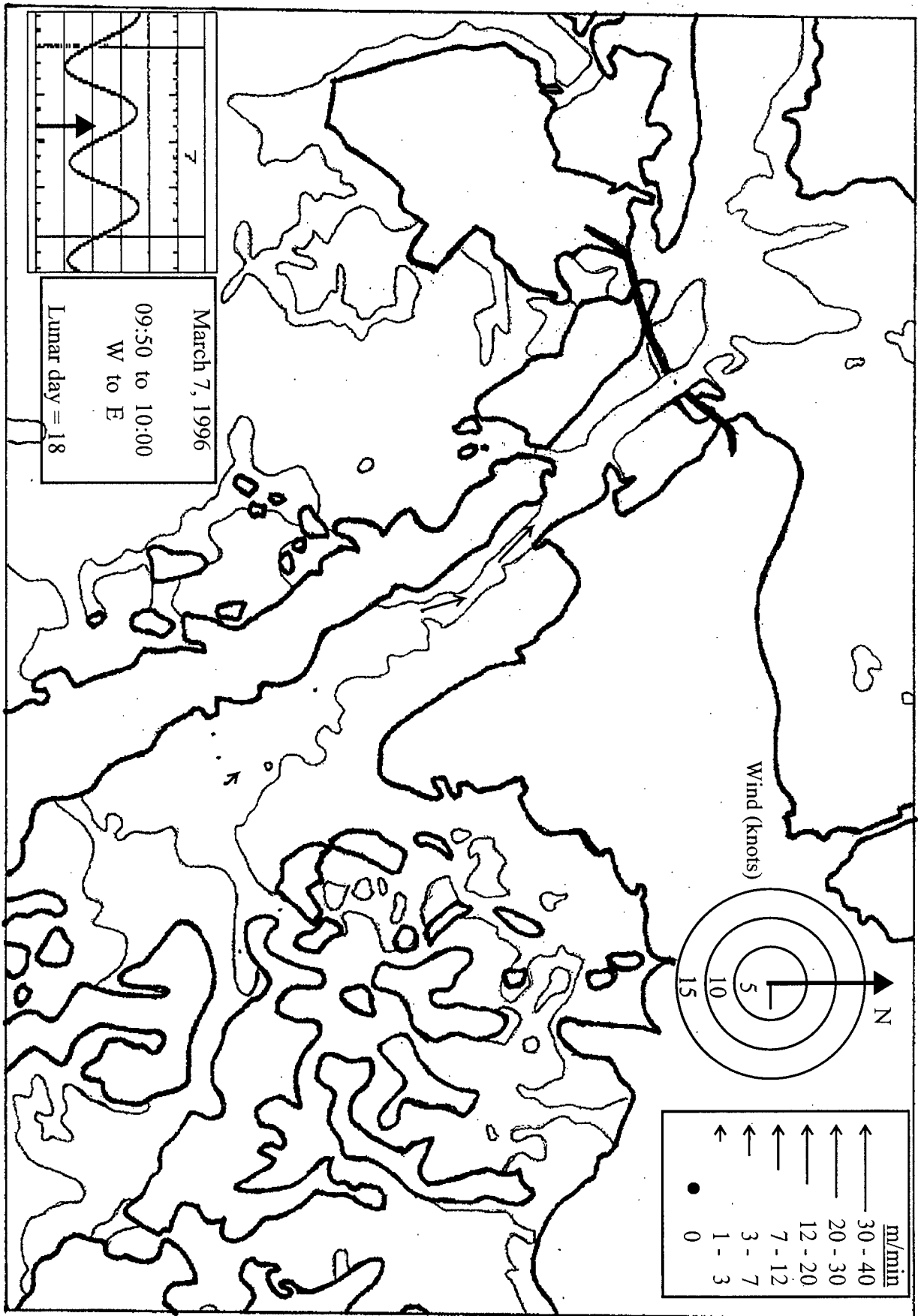
Oct. 16

High Tide 0931  
Low Tide 1518

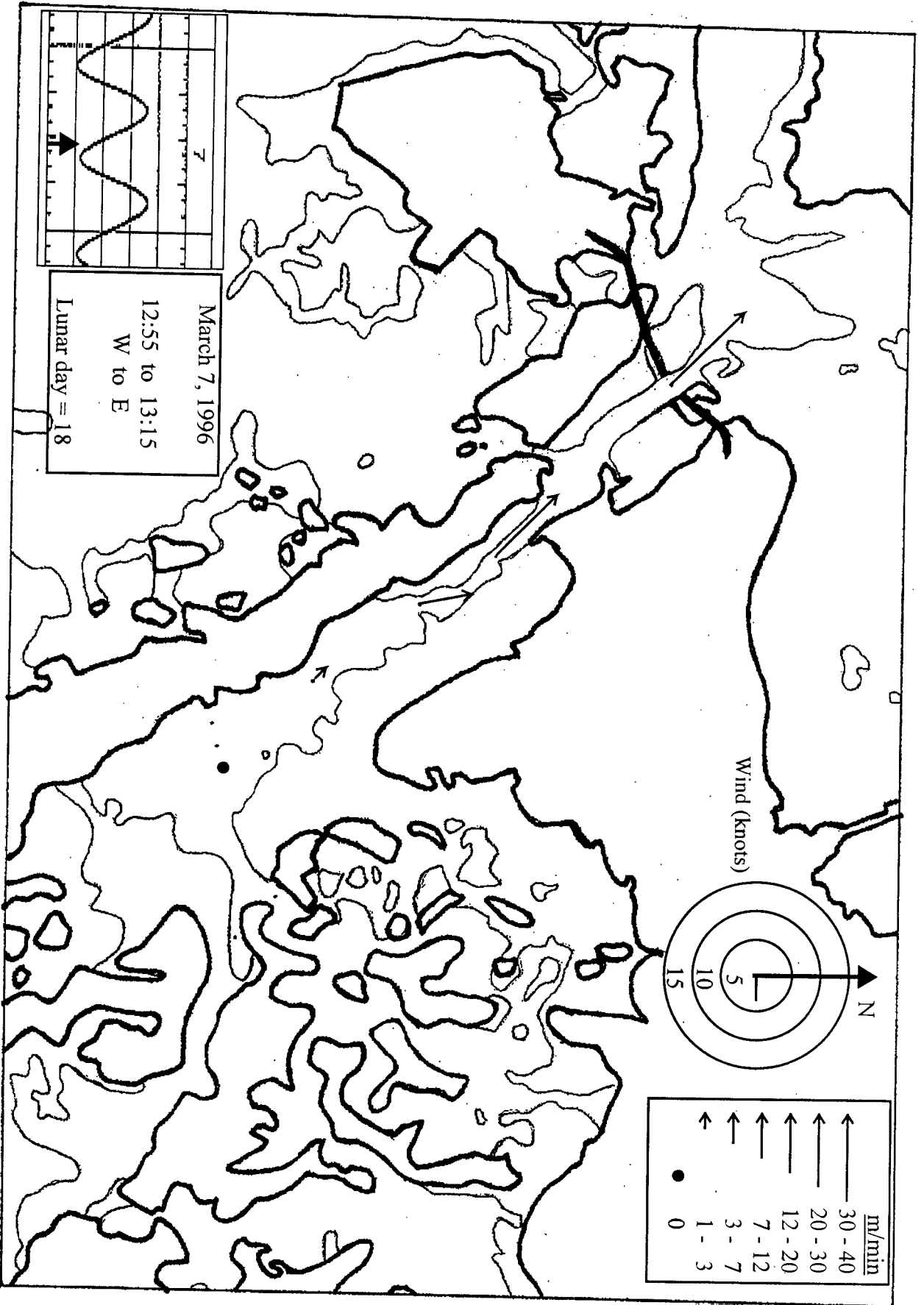
Wind from 165° at 9 kts

2 surface drogues

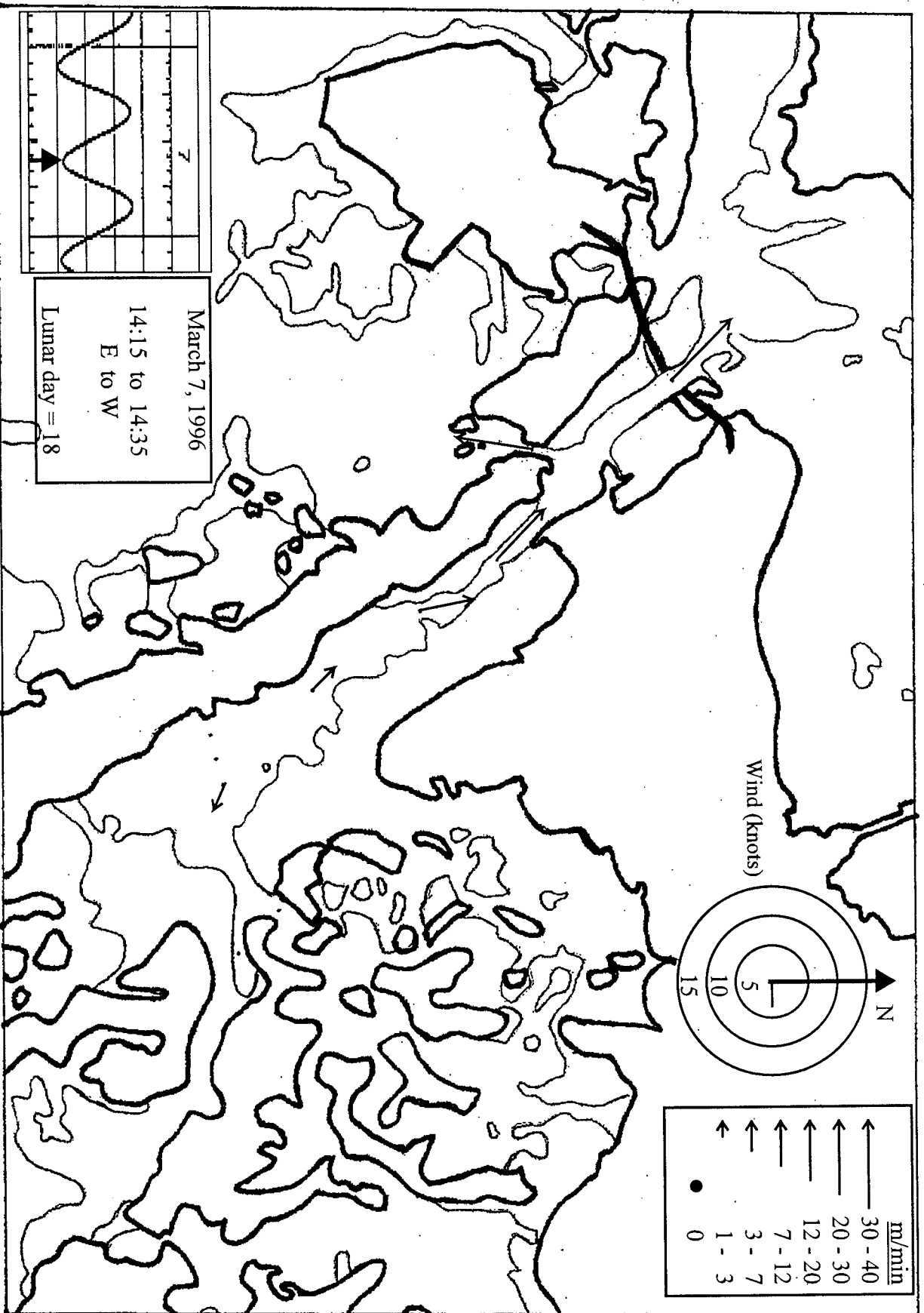
APPENDIX 2. CURRENTS IN LLEBUCEL AND IWAYAMA BAY



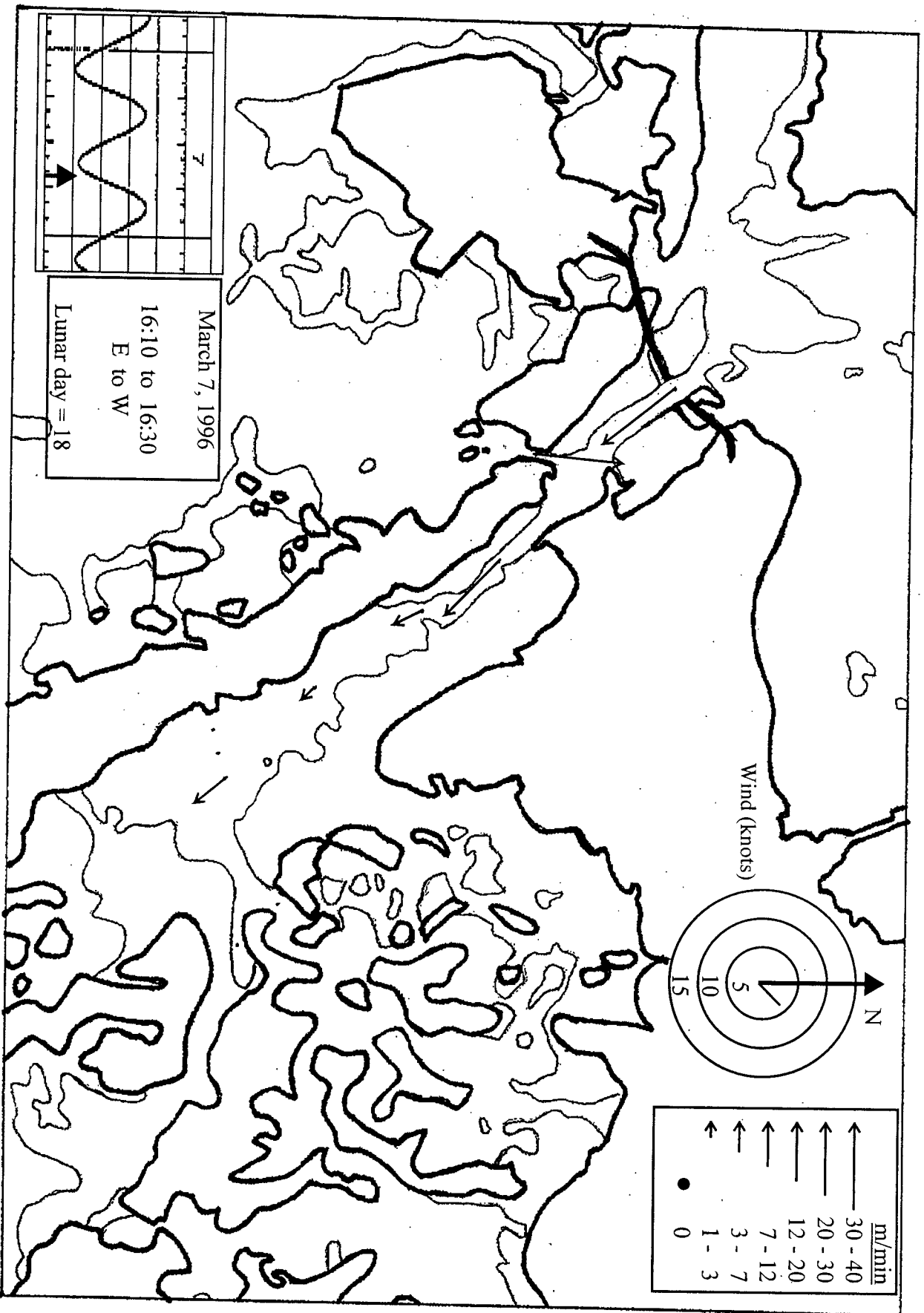
Very shallow drogues, which are affected somewhat by winds, were used on this day. Current speeds in this plot are very rough estimates.



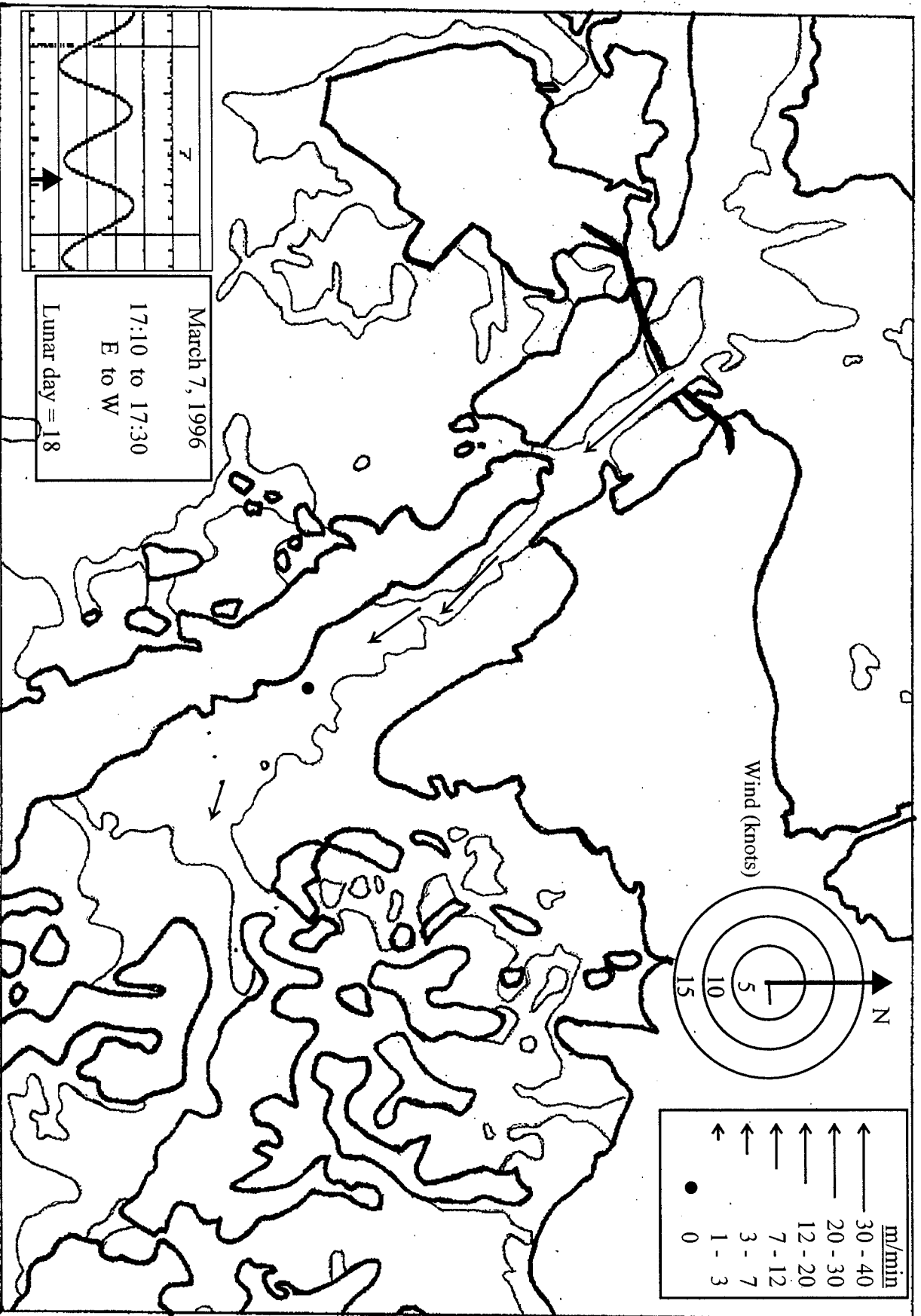
Very shallow drogues, which are affected somewhat by winds, were used on this day.



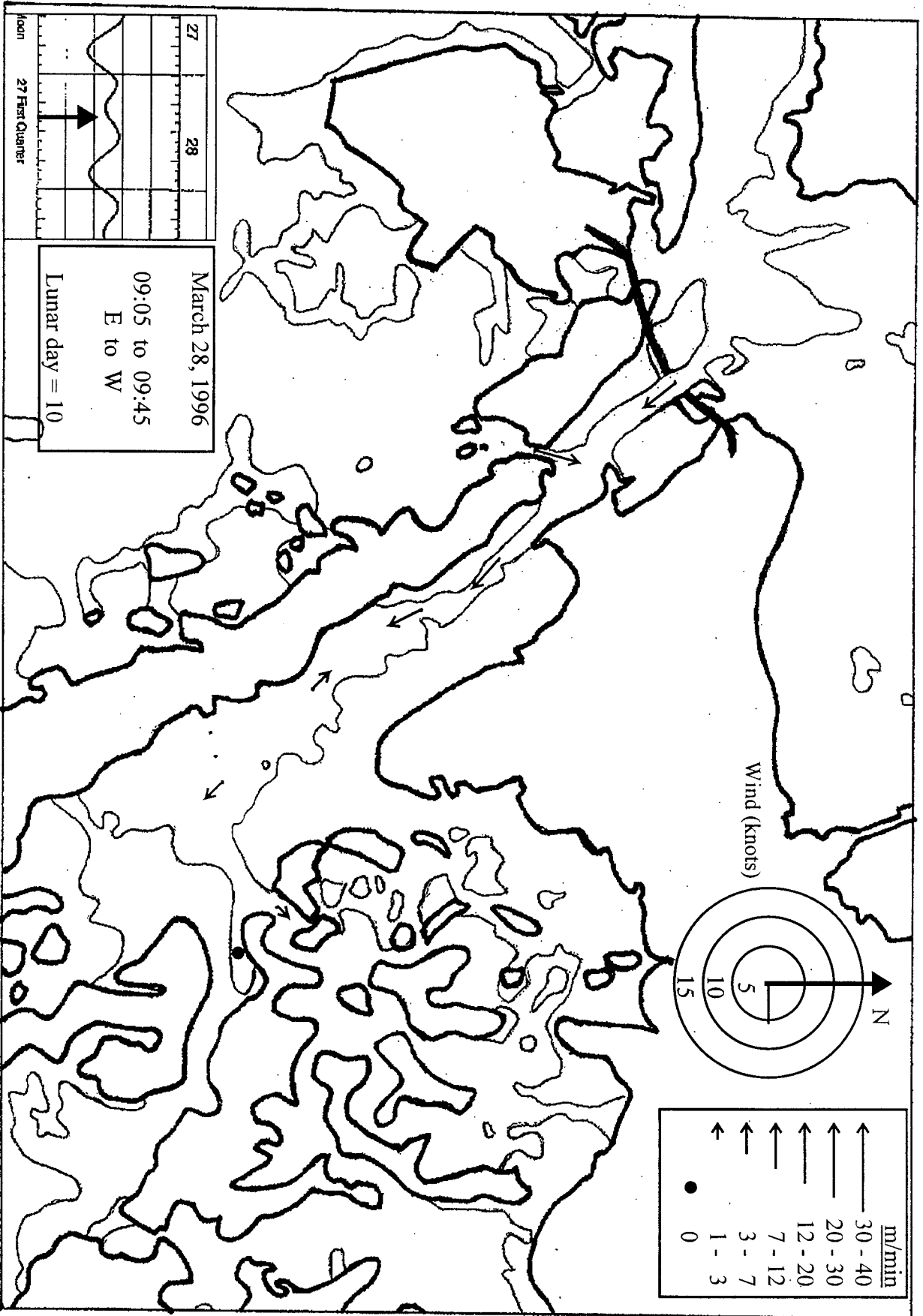
Very shallow drogues, which are affected somewhat by winds, were used on this day.



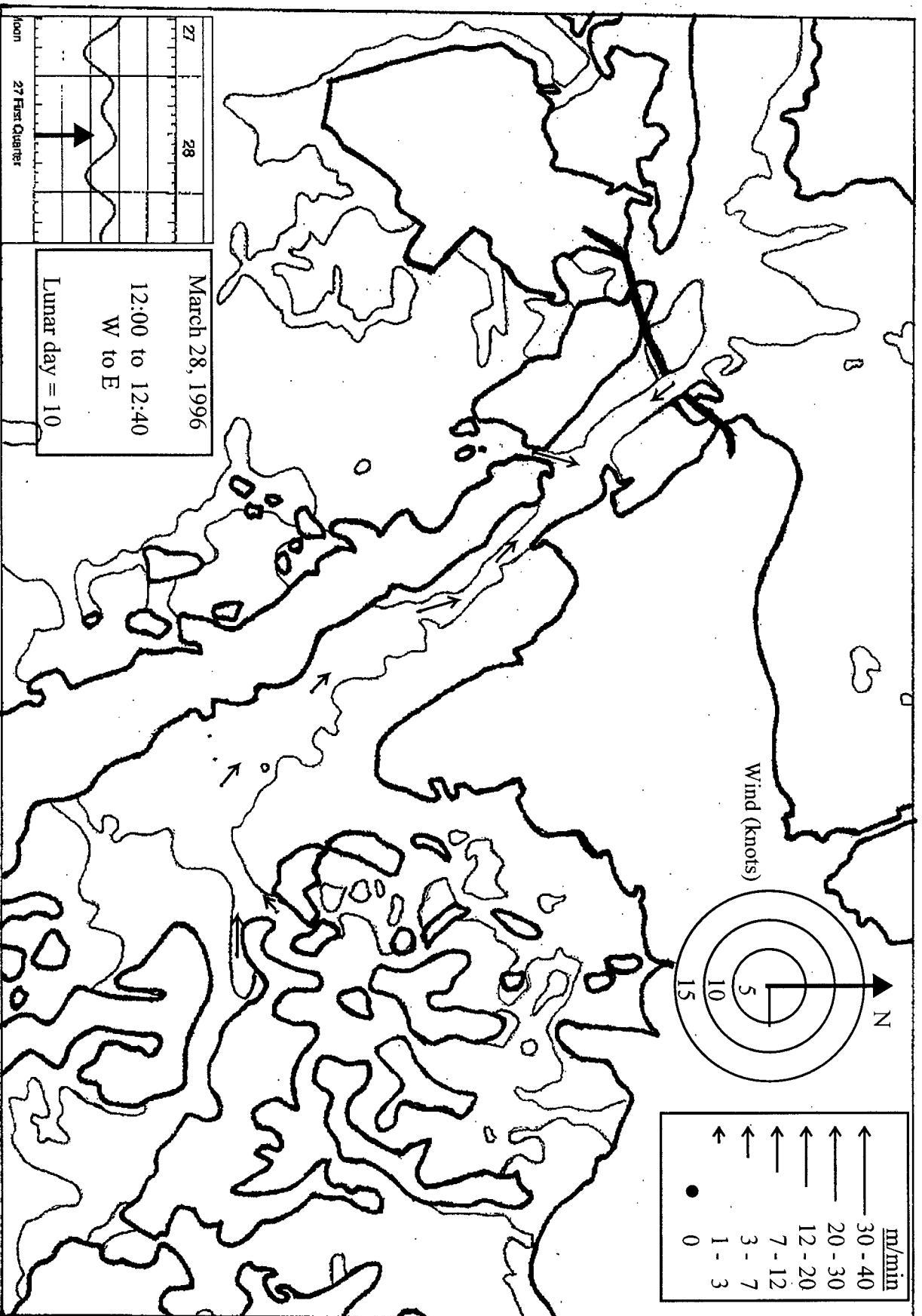
Very shallow drogues, which are affected somewhat by winds, were used on this day.



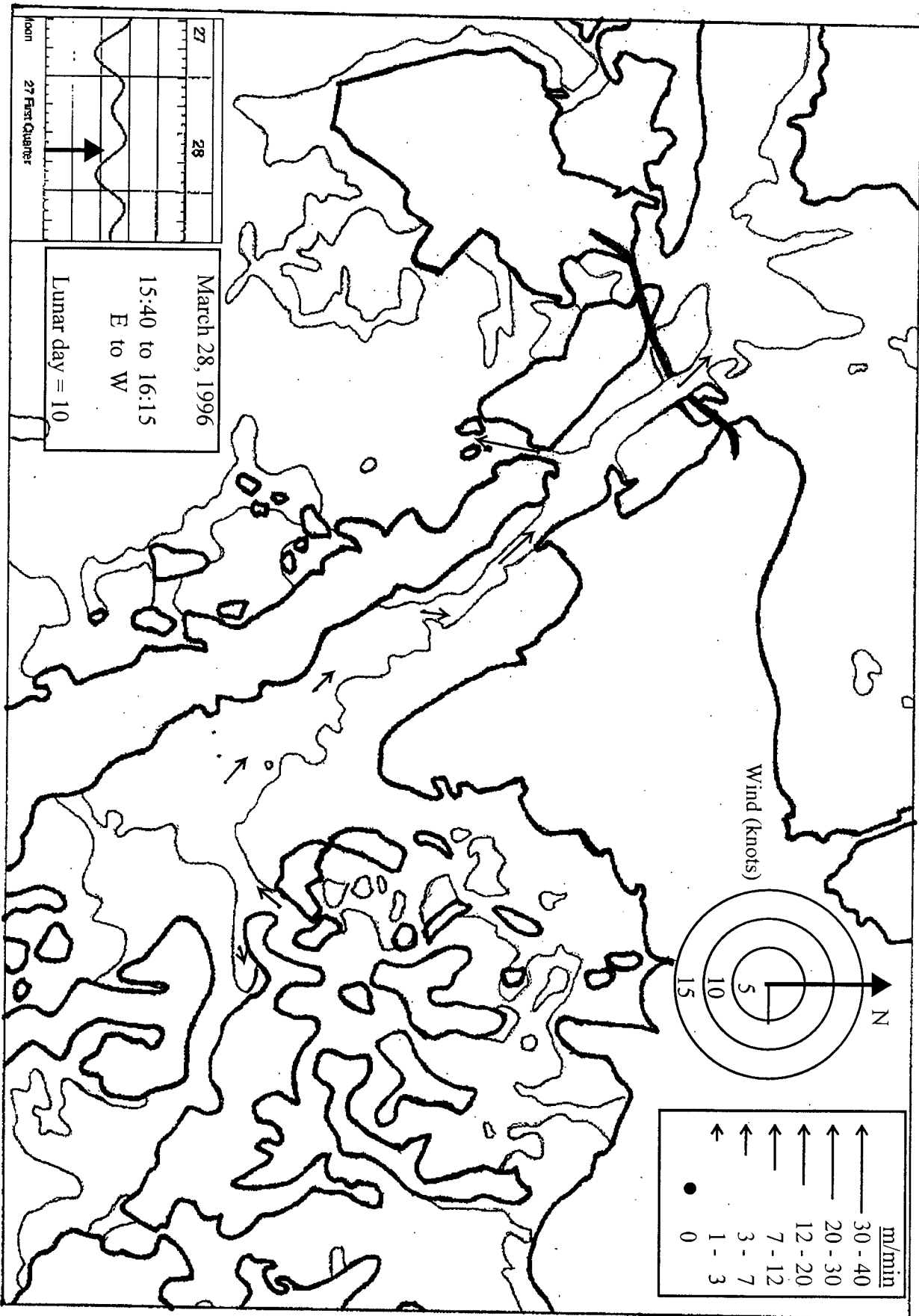
Very shallow drogues, which are affected somewhat by winds, were used on this day.

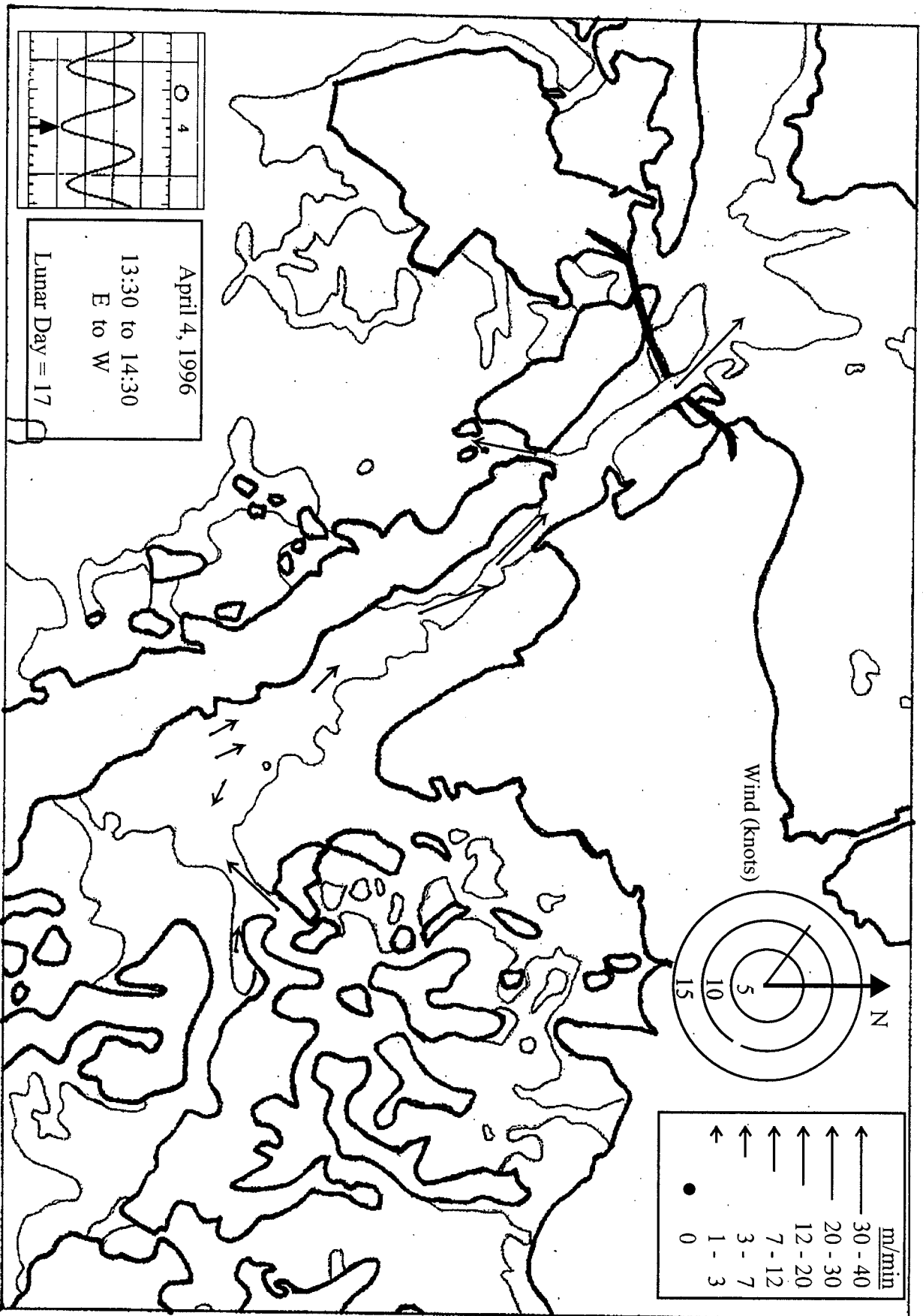


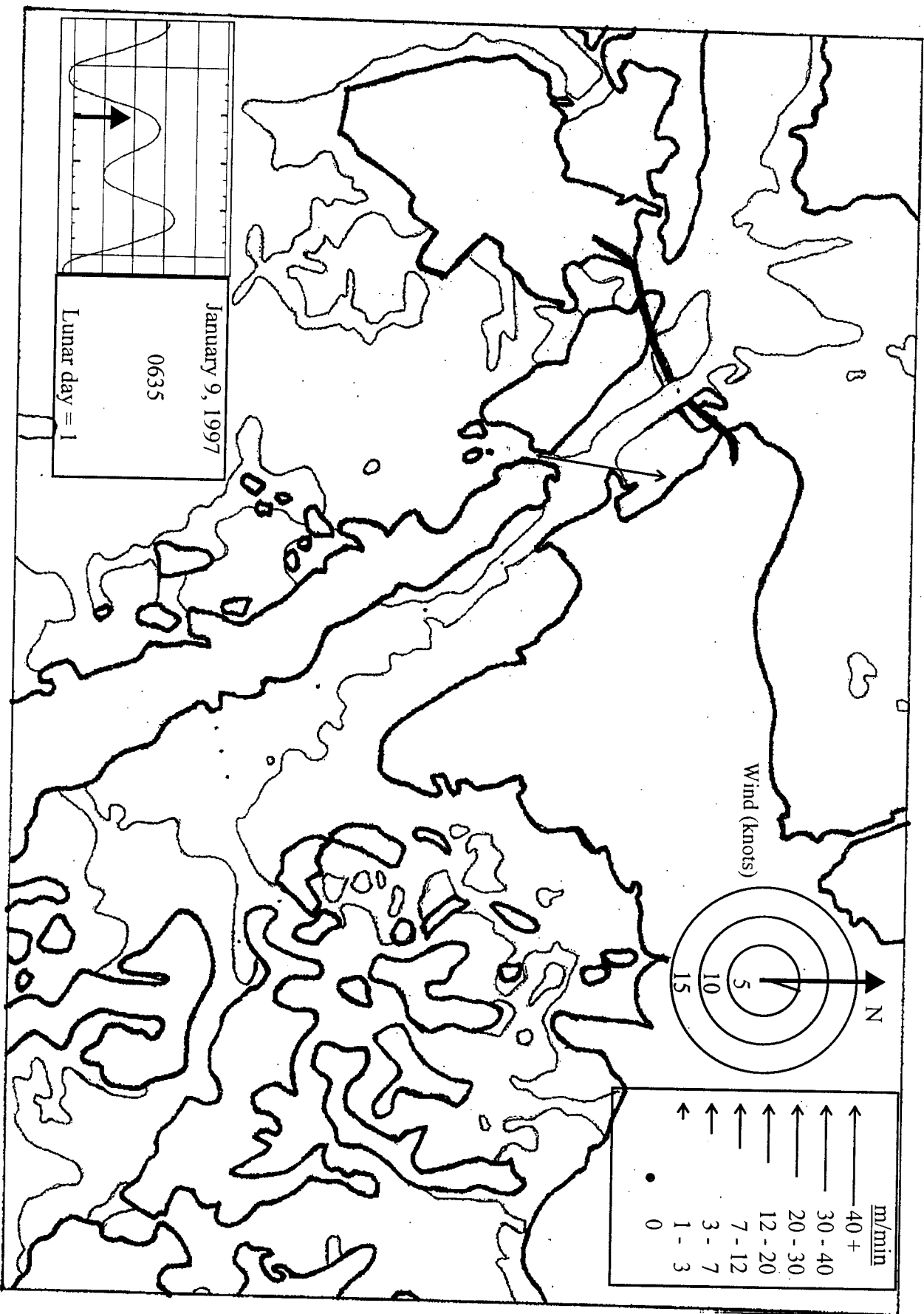


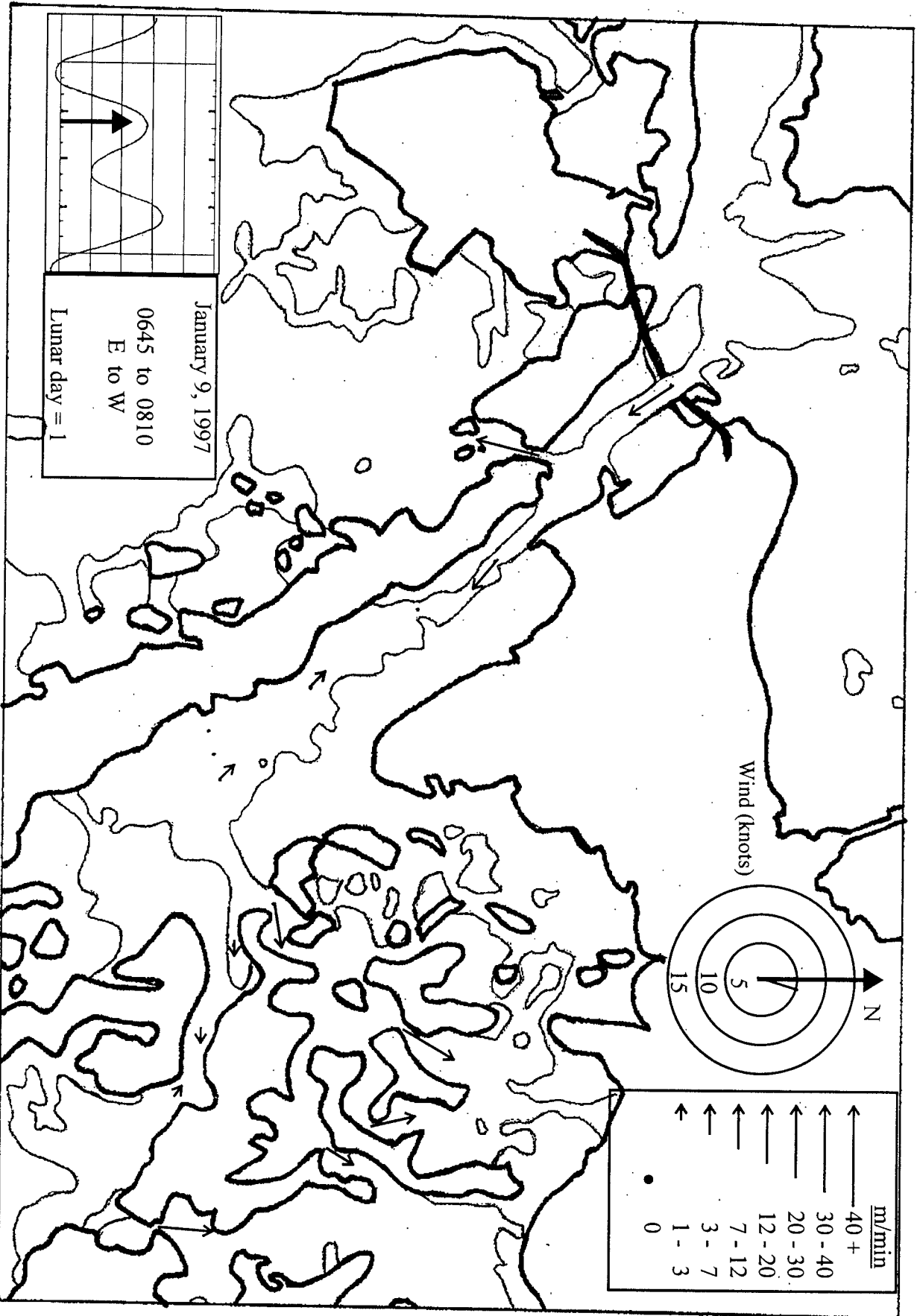


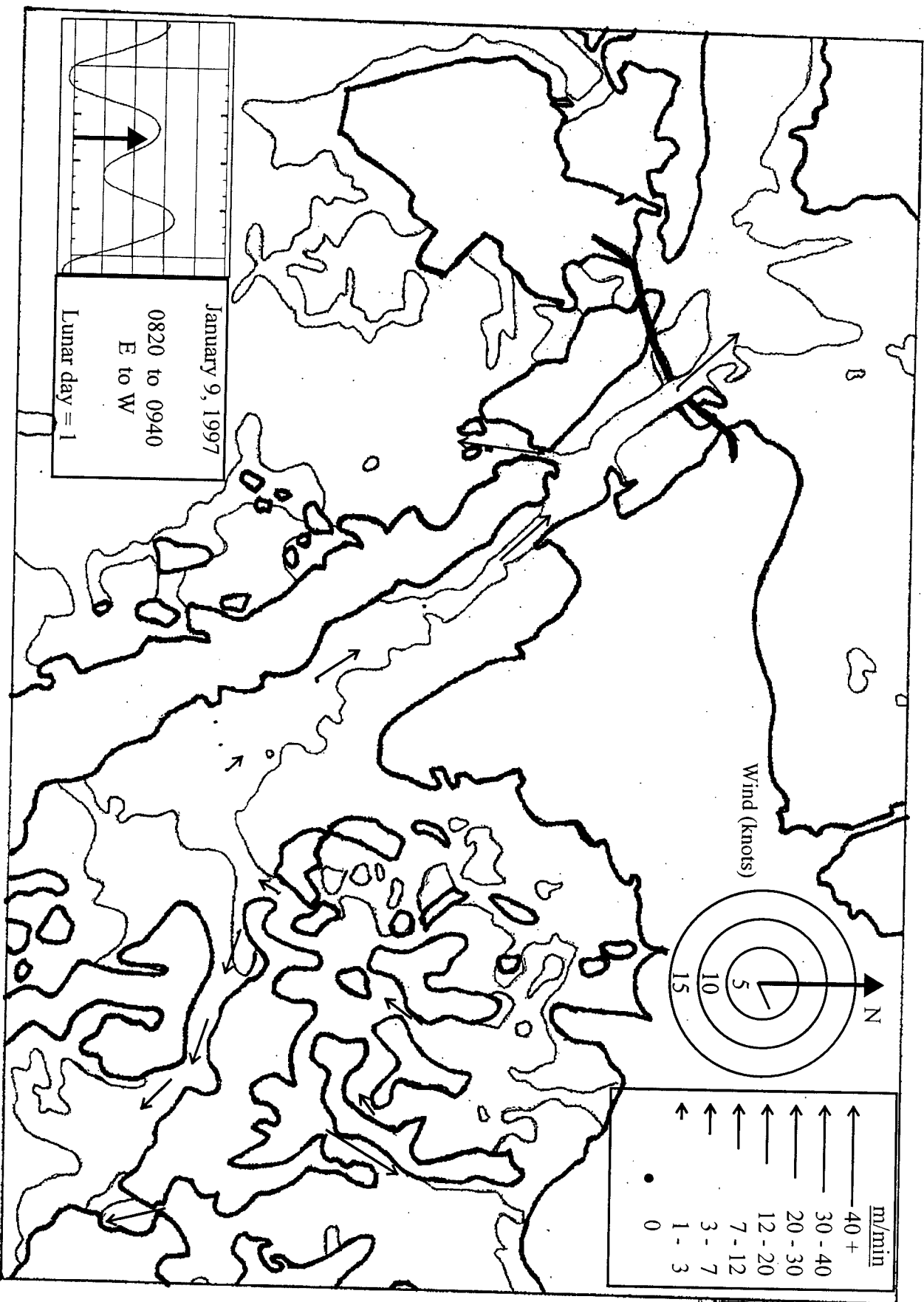
There was a 20-30 minute delay between the observations at A and B and at those stations just to the east; 5 minutes later the current at B was to the NW.

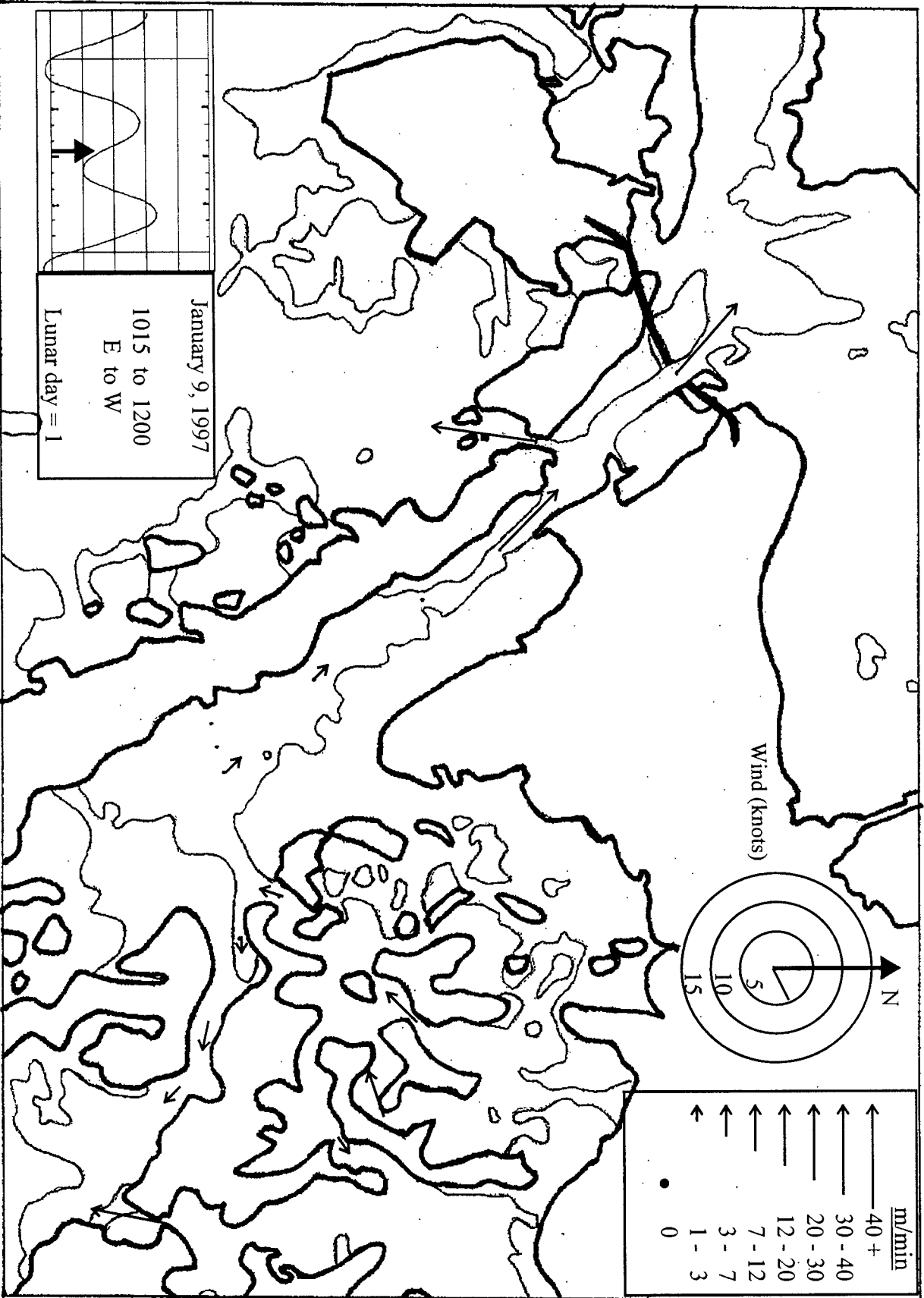


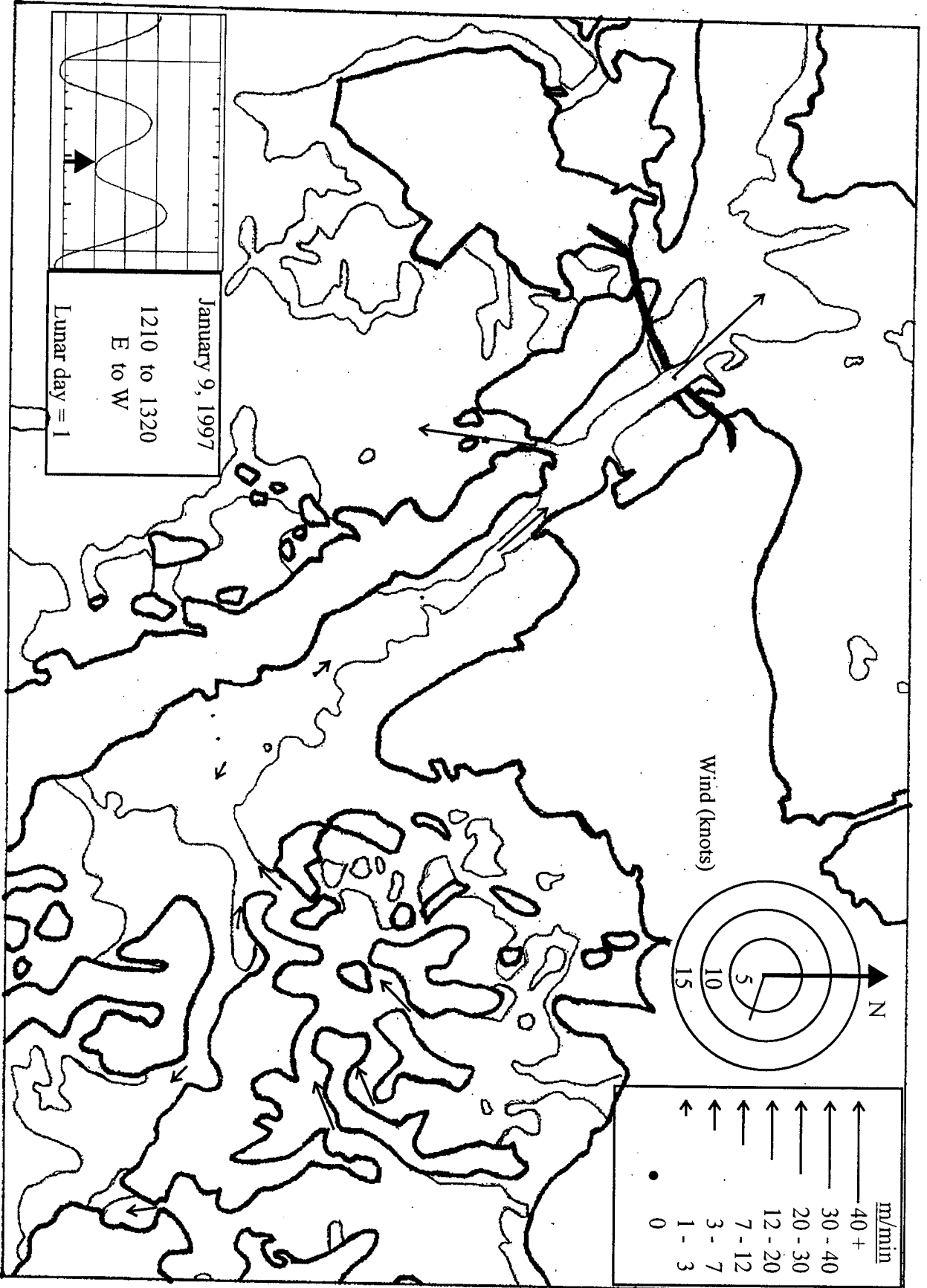




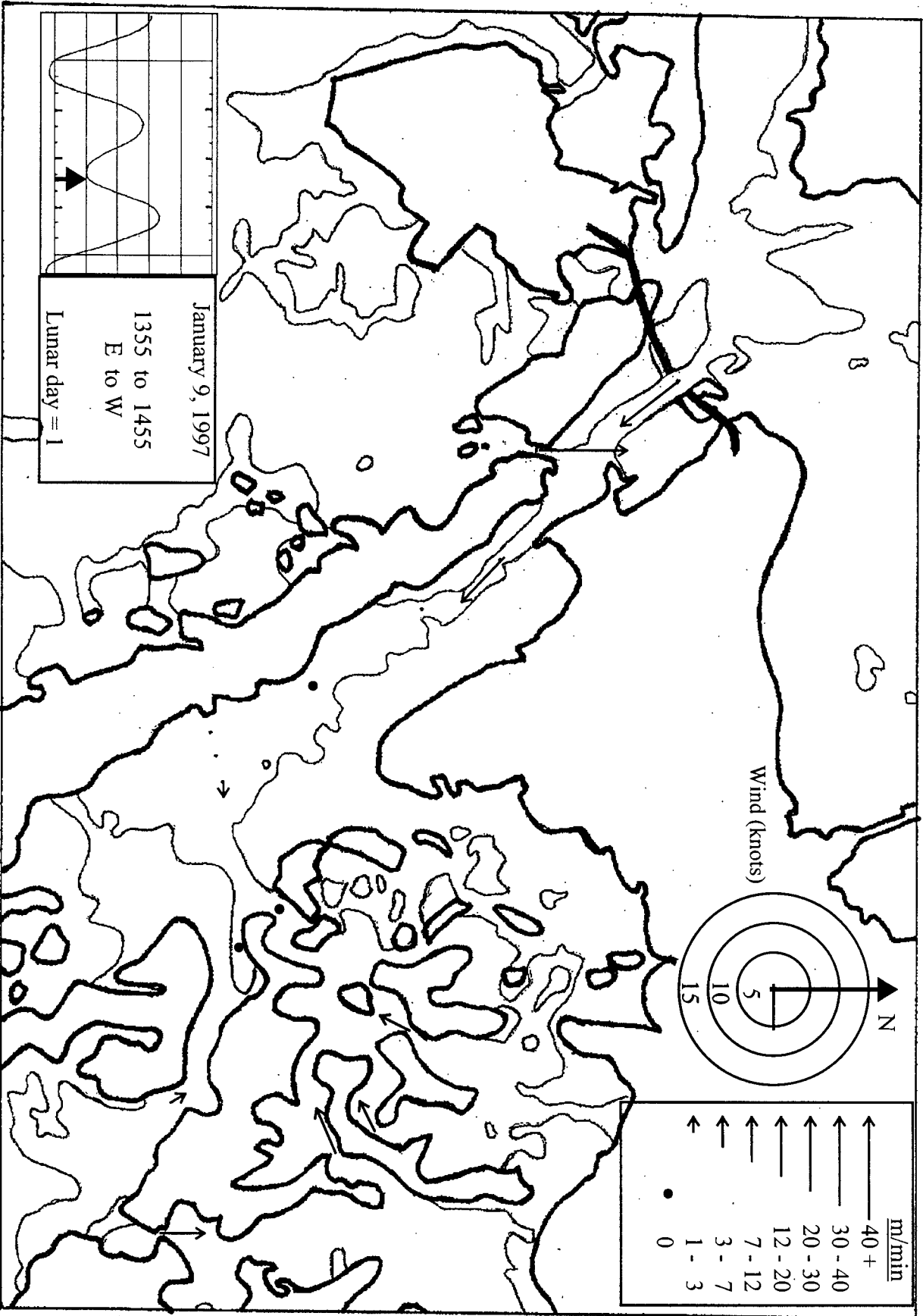


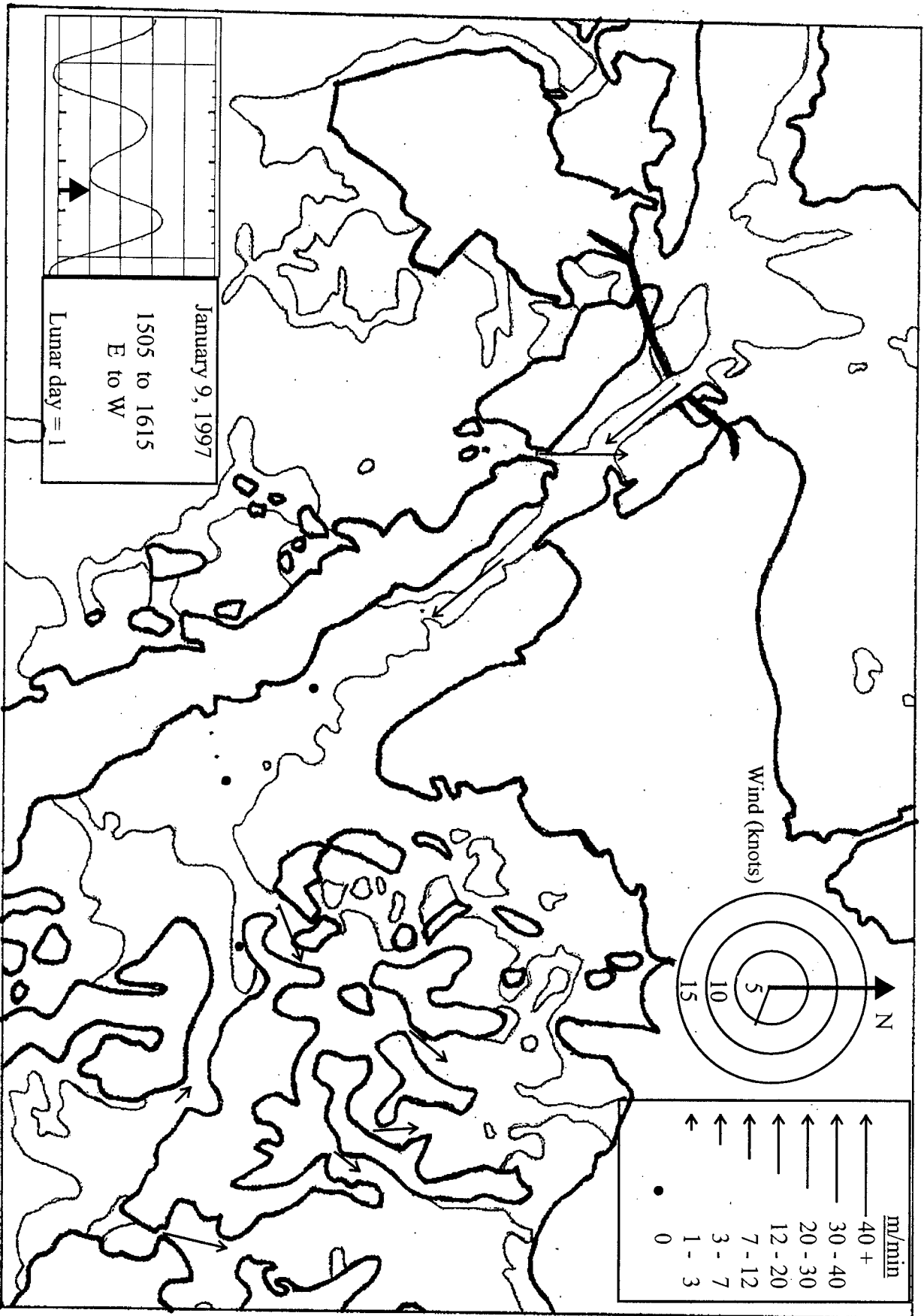












(Q) "Non-Point Source" means any origin from which pollutants emanate in an unconfined and unchanneled manner including but not limited to surface runoff and leachate seeps.

(R) "Off-Shore Waters" means all coastal waters beyond the limit defined for "near-shore" waters.

(S) *"Ordinary High Water Mark" shall mean that line upon the shore or bank established by fluctuations of water and indicated by physical characteristics, such as a clear natural line impressed on the bank, destruction of terrestrial vegetation, the presence of litter or debris, or other appropriate means.\**

(T) "Outstanding National Resource Waters" means the waters of national spawning grounds, preserves, and waters of exceptional recreational or ecological significance.

(U) "Person" means the Republic of Palau, a state, a political subdivision, a public or private institution, corporation, partnership, joint venture, association, firm or company organized or existing under the Laws of Palau or of any state or country, a lessee or other occupant of property, or any individual, acting singly or as a group.

(V) "Point Source" means any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, vessel or other floating craft from which pollutants are or may be discharged.

(W) "Pollutant" means but is not limited to dredged spoil, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical waste, biological material, radioactive materials, heat, wrecked or discarded equipment, rock, sand, and industrial, municipal and agricultural waste.

(X) "Pollutant Discharge" means either a point source or non-point source of pollutant discharge.

(Y) "Pollutant Discharge Permit" means any Republic of Palau Environmental Quality Protection Board Pollutant Discharge Permit issued pursuant to Sections 2401-11-21 through 2401-11-36, inclusive, of the Republic of Palau Environmental Quality Protection Board Marine and Fresh Water Quality Regulations.

(Z) *"Stream" shall mean a flowing body of fresh water that persists throughout most of the year, except under conditions of drought, and has a visually-defined bed and bank or "ordinary high water mark."\**

(AA) "Surface Water" means any water as found on the surface of the earth or under the influence of run off or other water.

(BB) *"Swamp Forest" shall mean a forest that occur where soils are flooded most of the year with fresh or slightly brackish water.\**

(CC) *"Undue Hardship" shall mean that the owner of the land has been denied all beneficial uses of the property that includes the buffer zone.\**

(DD) "Water Quality Certification" means a statement which asserts that a proposed discharge activity will not violate applicable water quality standards.

(EE) "Water Quality Standards" means standards established for any and all waters located within the Republic of Palau.

(FF) "Wetlands" means those areas that are inundated or saturated with surface or groundwater at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include saltwater swamps, freshwater/marshes, and cultivated wetlands. These waters shall be classified as surface water.

(Effective May 26, 1996)

(Amendment Effective September 15, 1999)

## WATER USE CLASSIFICATION

### **2401-11-05 Classification of Coastal Water Uses**

Coastal waters are classified in accordance with uses to be protected in each class as follows:

(A) Class AA Waters.

(1) The uses to be protected in this class of water are oceanographic research, the support and propagation of shellfish and other marine life, conservation of coral reefs and wilderness areas, compatible recreation and other aesthetic enjoyment.

(2) It is the objective that this class of waters remain as near to their natural state as possible with an absolute minimum of pollution from any source.

(3) To the extent possible, the wilderness character of such areas shall be protected. No point source discharge will be permitted in these waters, nor will destruction of reefs, aquatic habitats or other resources be permitted.

(4) The classification of any water areas as Class AA shall not preclude other uses of such waters compatible with these objectives and in conformance with the standards applicable to them.

(B) Class A Waters.

(1) The uses to be protected in this class of waters are recreational (including fishing, swimming, bathing, and other water contact sports), aesthetic enjoyment, and the support and propagation of aquatic life.

(2) It is the objective that in this class of waters, use for recreational purposes and aesthetic enjoyment shall not be limited in any way.

(3) Class A waters shall be kept clean of any trash, solid materials and oil, and shall not act as receiving waters for any effluent which has not received the highest degree of treatment or control practicable under existing technological and economic conditions and shall be compatible with the standards established for this class.

(C) Class B Waters.

(1) The uses to be protected in this class of waters are small boat harbors, commercial and industrial shipping, bait fishing, compatible recreation, *over-water commercial or residential structures for recreational or domestic use\**, the support and propagation of aquatic life, and aesthetic enjoyment.

(2) It is the objective for this class of waters that discharge of any pollutant be controlled to the maximum extent possible and that sewage and industrial effluent receive the highest degree of treatment practicable under existing technological and economic conditions,

and shall be compatible with the standards established for this class.

(3) The Class B designation should apply only to a limited area next to boat docking facilities. *No coastal areas with a coastal mangrove fringe greater than 50 feet in width shall be classified as Class B waters after the effective date of this amendment.\**

(4) The rest of the water area in such bay or harbor not falling within the area identified in the previous paragraph shall be Class A unless given some other specific designation.

(Effective May 26, 1996)  
\*(Amendment Effective May 18, 1998)

#### **2401-11-06 Classification of Fresh Water Uses**

Fresh waters are classified in accordance with the uses to be protected as follows:

(A) Class 1 Waters.

(1) The uses to be protected in this class of waters are drinking water supply, food processing, the support and propagation of aquatic life, and compatible recreation.

(2) It is the objective that this class of waters remain in as near their natural state as possible with an absolute minimum of pollution from any source. To the extent possible, the wilderness character of such areas shall be protected. Waste discharge into these waters is prohibited.

(B) Class 2 Waters.

(1) The uses to be protected in this class of waters are bathing, swimming, the support and propagation of aquatic life, compatible recreation, and agricultural water supply.

(2) It is the objective for this class of waters that their use for recreational purposes, propagation of fish and other aquatic life and agricultural and industrial water supply not be limited in any way. Such waters shall be kept clean of trash, solid waste materials and oils and shall not act as receiving waters for any effluent which has not received the highest degree of treatment or control practicable under existing technological and economic conditions, and shall be compatible with the standards established for this class.

(Effective May 26, 1996)

#### **2401-11-07 Classification of Groundwater**

(A) Class I: Special Groundwater are those that are highly vulnerable to contamination because of the hydrological characteristics of the areas under which they occur and that are also characterized by either of the following two factors:

(1) Irreplaceable, in that no reasonable alternative source of drinking water is available to substantial populations; or

(2) Ecologically Vital, in that the aquifer provides the base flow for a particularly sensitive ecological system that, if polluted, would destroy a unique habitat.

(B) Class II: Current and potential sources of drinking water and waters having other beneficial uses and all other groundwater that are currently used or are

potentially available for drinking water or other beneficial use.

(C) Class III: Groundwater not considered potential sources of drinking water and of limited beneficial uses are groundwater that are heavily saline, with total dissolved solids levels over 10,000 mg/l or are otherwise contaminated beyond levels that allow cleanup using methods reasonably employed in public water system treatment. These groundwater also must not migrate to Class I or II groundwater or have a discharge to surface water that could cause degradation.

(Effective May 26, 1996)

#### **2401-11-08 Classification of Groundwater Areas**

(A) Class I Groundwater Areas: All sources of fresh groundwater on all islands whether publicly or privately owned, used or potentially used, for domestic, culinary or food processing purposes.

(B) Class II Groundwater Areas: All fresh groundwater not included in Class I or Class III.

(C) Class III Groundwater Areas: All groundwater not considered potential sources of drinking water and of limited beneficial use which are heavily saline, with total dissolved solids levels over 10,000 mg/l, or which are otherwise contaminated beyond levels that allow cleanup using methods reasonably employed in public water system treatment.

(Effective May 26, 1996)

### **WATER QUALITY STANDARDS**

#### **2401-11-09 Basic Criteria Applicable to All Waters**

(A) All waters shall be capable of supporting desirable aquatic life and shall be suitable for recreation in and on the water.

(B) In furtherance of the goal set forth in Division A of this Section, all waters shall be:

(1) Free of visible floating materials, oils, greases, scum and other floating matter attributable to human activities;

(2) Free from materials attributable to sewage, industrial waste or other human activities that produce visible turbidity or settle out to form deposits;

(3) Free from materials attributable to sewage, industrial waste or other human activities that produce objectionable color, odor or taste directly or by chemical or biological action with the water or the life forms in the water;

(4) Free from substances attributable to human activities that induce undesirable aquatic life or degrade the indigenous biota;

(5) Maintained free of toxic substances in concentrations that are toxic to or that produce detrimental physiological responses in human, plant, animal, or aquatic life. Compliance with this objective will be determined by use of indicator organisms, analysis of species diversity, population density, growth anomalies, bioassay of appropriate duration or other

appropriate methods as specified by the Board. The survival of aquatic life in waters subjected to waste discharge or other controllable water quality factors shall not be less than that for the same water body in areas unaffected by the waste discharge, or when necessary for other control water that is consistent with the requirements for "experimental water" as described in *Standard Methods for the Examination of Water and Wastewater*, latest edition. As a minimum, compliance with this objective as stated in the previous sentence shall be evaluated with a ninety-six (96) hour bioassay; and,

(6) The Board shall apply natural background levels in place of specified water quality criteria standards if natural background water quality is better than that specified in other provisions of the standards in order to preserve the water quality found in the natural state to prevent the degradation of natural conditions and implement the anti-degradation provisions in Section 2401-11-03. [See: Section 2401-11-20(C)].

(Effective May 26, 1996)

**2401-11-10 Microbiological Standards**

| STANDARD                                                                                                                                                          | APPLICABLE CLASSES |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| (A) The median total or fecal coliform bacteria count shall not exceed 70/100ml for any 10 consecutive samples nor shall any single sample exceed 230/100 ml.     | AA and 1           |
| (B) Fecal Coliform count shall not exceed a geometric mean of 200/100ml for any 10 consecutive samples nor shall any single sample exceed 400/100 ml.             | A, B and 2         |
| (C) Enterococci count shall not exceed a geometric mean of 33/100ml for any 5 samples in a given 30 day period nor shall any single sample shall exceed 60/100ml. | AA and A           |
| (D) In areas where shellfish are harvested for human consumption, the micro-biological standards for Class AA and 1 Waters shall apply.                           | A, B and 2         |

(Effective May 26, 1996)

**2401-11-11 pH Standards**

| STANDARD                                                             | APPLICABLE CLASSES |
|----------------------------------------------------------------------|--------------------|
| (A) pH variation shall be within 7.7 and 8.5 pH units.               | AA, A and B        |
| (B) pH variation shall not be greater than 0.2 pH units from natural | 1                  |

|                                                                                                                                                                            |   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| conditions; but not lower than a pH of 6.5 or higher than a pH of 8.5 from other than natural causes.                                                                      |   |
| (C) pH variation shall not be greater than 0.5 pH units from natural conditions; but not lower than a pH of 6.5 or higher than a pH of 8.5 from other than natural causes. | 2 |

(Effective May 26, 1996)

**2401-11-12 Nutrient Material**

| STANDARD                                                                                                                  | APPLICABLE CLASSES                                                                       |
|---------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| (A) The ratio of total nitrogen to total phosphorus concentration shall be within:                                        |                                                                                          |
| (1) 11.1 - 27.1                                                                                                           | AA and A                                                                                 |
| (2) 6.1 - 18.1                                                                                                            | B                                                                                        |
| (3) 10% variation of the naturally occurring ratio                                                                        | 1 and 2                                                                                  |
| (B) The concentration of total nitrogen and total phosphorus shall not vary by more than 10% from the natural conditions. | All Waters                                                                               |
| (C) Except for concentrations attributable to natural causes nutrient concentration shall not exceed:                     |                                                                                          |
| (1) Total Phosphorus                                                                                                      |                                                                                          |
| (a) 0.025 mg/l as P                                                                                                       | AA and A                                                                                 |
| (b) 0.500 mg/l as P                                                                                                       | B                                                                                        |
| (c) 0.200 mg/l as P                                                                                                       | 1 and 2                                                                                  |
| (d) 0.050 mg/l as P                                                                                                       | Fresh Waters entering lakes or reservoirs (at a point of entry) and lakes and reservoirs |
| (2) Total Nitrogen                                                                                                        |                                                                                          |
| (a) 0.400 mg/l as N                                                                                                       | AA and A                                                                                 |
| (b) 0.800 mg/l as N                                                                                                       | B                                                                                        |
| (c) 0.750 mg/l as N                                                                                                       | 1                                                                                        |
| (d) 0.500 mg/l as N                                                                                                       | 2                                                                                        |

(Effective May 26, 1996)

**2401-11-13 Dissolved Oxygen**

| <u>STANDARD</u>                                                                                                     | <u>APPLICABLE CLASSES</u> |
|---------------------------------------------------------------------------------------------------------------------|---------------------------|
| (A) Dissolved oxygen concentrations shall not vary by more than 25% from natural conditions.                        | All Waters                |
| (B) Except for concentrations attributable to natural causes dissolved oxygen concentration shall not be less than: |                           |
| (1) The greater of 6.0 mg/l, 75% or Saturation                                                                      | AA and 1                  |
| (2) 5.0 mg/l                                                                                                        | A and 2                   |
| (3) 4.5 mg/l                                                                                                        | B                         |

(Effective May 26, 1996)

**2401-11-14 Total Dissolved Solids, Salinity, Currents**

| <u>STANDARD</u>                                                                                                                                                                                                                                                                                                                             | <u>APPLICABLE CLASSES</u> |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| No change in channels, basin geometry or water influx shall be made which would cause permanent changes in isohaline patterns of more than 10% from natural conditions or change in salinity outside the range of 29-35 parts per thousand or which would otherwise adversely affect the indigenous biota and natural sedimentary patterns. | All Waters                |

(Effective May 26, 1996)

**2401-11-15 Temperature**

| <u>STANDARD</u>                                                                                                                            | <u>APPLICABLE CLASSES</u> |
|--------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| Temperature shall not vary by more than 1.5 degree Fahrenheit (0.9 degree Celsius) from the natural conditions in marine and fresh waters. | All Waters                |

(Effective May 26, 1996)

**2401-11-16 Turbidity**

| <u>STANDARD</u>                                                            | <u>APPLICABLE CLASSES</u> |
|----------------------------------------------------------------------------|---------------------------|
| Turbidity as measured by Nephelometric Turbidity Units (NTU) shall not be: |                           |
| (A) Greater than 1 NTU                                                     | AA and A                  |
| (B) Greater than 2 NTU                                                     | B                         |
| (C) Greater than 5% above natural conditions                               | 1                         |
| (D) Greater than 10% above                                                 | 2                         |

natural conditions

(Effective May 26, 1996)

**2401-11-17 Radioactive Materials**

| <u>STANDARD</u>                                                                                                                                                                                                                                                  | <u>APPLICABLE CLASSES</u> |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| (A) The concentration of radioactive materials in water shall not exceed 1/30th of the maximum permissible limits established for continuous occupational exposure given in the latest edition of the <i>U.S. National Bureau of Standards Handbook No. 69</i> . | All Waters                |
| (B) No radionuclides shall be present in amounts that would exceed the maximum permissible levels established in the Republic of Palau Public Water Supply Regulations.                                                                                          | All Waters                |
| (C) The concentration of radioactive materials in water shall not result in the accumulation of radioactivity in plants or animals that would result in a hazard to humans or aquatic life.                                                                      | All Waters                |

(Effective May 26, 1996)

**2401-11-18 Oil and Petroleum Products**

| <u>STANDARD</u>                                                                                                                            | <u>APPLICABLE CLASSES</u> |
|--------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| The concentration of oil and petroleum products shall not:                                                                                 |                           |
| (A) Be detectable as a visible film sheen or discoloration of the surface or cause an objectionable odor.                                  | All Waters                |
| (B) Cause tainting of fish or other aquatic life, be injurious to the indigenous biota, or cause an objectionable taste in drinking water. | All Waters                |
| (C) Form an oil deposit on beaches or shorelines or on the bottom of a body of water.                                                      | All Waters                |

(Effective May 26, 1996)

**2401-11-19 Toxic Substances**

Marine and fresh water standards for toxic substances are set forth in Appendix A to the these Marine and Fresh Water Quality Regulations. The Board may amend Appendix A from time to time to add additional substances or modify the standards for particular substances as the Board deems appropriate.

(Effective May 26, 1996)

**2401-11-20 General Conditions**

(A) All methods of sample collection, preservation, and analysis used to determine compliance with these standards shall be in accordance with those specified in the latest edition of *Standard Methods for the Examination of Water and Wastewater*, by the American Public Health Association or methods specified by the United States Environmental Protection Agency in 40 CFR Section 136 *et seq.*, as appropriate. Samples should be collected at approximately equal intervals and under those conditions of tide, rainfall, and time of day when pollution is most likely to be the greatest or at a maximum level.

(B) Whenever water quality standards are exceeded, samples shall be taken at frequent intervals to be determined by the Board according to the severity of the violation.

(C) Whenever natural conditions are of a better quality than an assigned water quality criteria, the natural conditions shall constitute the water quality criteria. [See also: Sections 2401-11-03(E) and 2401-11-09(B)(6)].

(D) Whenever two numeric criteria are in conflict, the more stringent criteria shall constitute the water quality criteria.

(E) Pollutant discharge to either surface or ground waters shall be controlled so as to protect not only the receiving water but also those waters into which the receiving waters may flow.

(Effective May 26, 1996)

**IMPLEMENTATION MEASURES****2401-11-21 Approval Required for New or Increased Pollutants**

(A) It shall be a violation of these regulations for any person to initiate any project which may represent a new or increased source of pollution, either point source or non-point source, without first obtaining written approval of the EQPB.

(B) It is incumbent upon the person initiating the project to demonstrate to the EQPB that the project will not directly or indirectly impair any beneficial uses of the affected waters.

(C) The EQPB may place conditions of the construction and/or operation of the project as necessary to mitigate or eliminate any adverse water quality impacts associated with the project.

(D) The EQPB may withhold approval for any project until the project has received all necessary permits and clearances or has demonstrated that such clearances will be obtained at the appropriate time.

(Effective May 26, 1996)

**2401-11-22 Discharge Permit Required**

Any point source of discharge shall be in violation of these regulations unless the discharge operator has received a Pollutant Discharge Permit from the EQPB.

(Effective May 26, 1996)

**2401-11-23 Written Approval for Hazardous Substances**

It shall be in violation of these regulations for any person to store, dispose of or allow to accumulate any hazardous substance in such a manner that the substance may enter the surface or ground waters of the Republic of Palau without first obtaining written approval of the EQPB. Such substances include, but are not limited to petroleum products, pesticides, radioactive substances, and toxic chemicals. The EQPB may require persons handling hazardous substances to implement measures to reduce the possibility of contaminating the surface or ground waters of the Republic of Palau.

(Effective May 26, 1996)

**2401-11-24 Response to Spills**

(A) In the event of an accidental spill or discharge of hazardous substances, the responsible person shall immediately notify the EQPB and take all reasonable measures to contain the material so that it will not contaminate the surface or ground waters of the Republic of Palau.

(B) Failure to notify the EQPB within 24 hours and take reasonable mitigation measures shall also constitute a violation of these regulations.

(Effective May 26, 1996)

**TRANSITION UNDER COMPACT****2401-11-25 Definitions**

Unless specifically indicated otherwise, or unless the context clearly requires a different meaning, for the purposes of Sections 2401-11-25 through 2401-11-29, inclusive:

(A) "NPDES Permit" means any USEPA National Pollutant Discharge Elimination System Permit issued by the USEPA under the authority of the U.S. Federal Water Pollution Control Act Amendments of 1972, 82 Stat. 886, 33 U.S.C. 1251, *et seq.*, as amended by the Clean Water Act of 1977, 91 Stat. 1566, 33 U.S.C. 1251, *et seq.*, and the Water Quality Act of 1987, 101 Stat. 7, 33 U.S.C. 1251, *et seq.*

(B) "USEPA" means the United States Environmental Protection Agency.

(Effective May 26, 1996)

**2401-11-26 Continuation of NPDES Permits**

(A) All NPDES Permits, and the terms and conditions thereof, in effect on September 29, 1994 for

discharges within the territory of the Republic of Palau shall continue in effect after the implementation of the Compact of Free Association between the Republic of Palau and the United States of America and are hereby adopted as EQPB Pollutant Discharge Permits.

(B) All holders of NPDES Permits and those that discharge pollutants, whether directly or indirectly, whether from point-sources or non-point-sources must continue to abide by the terms and conditions of the NPDES permits (as adopted as EQPB Pollutant Discharge Permits) until they are replaced by a subsequent EQPB Pollutant Discharge Permit.

(Effective May 26, 1996)

#### **2401-11-27 Palau Discharge Permit Application Required**

All holders of NPDES Permits and those that discharge pollutants, whether directly or indirectly, whether from point-sources or non-point-sources shall, within 90 days of the implementation of the Compact of Free Association, apply to the EQPB for a new or revised Pollutant Discharge Permit.

(Effective May 26, 1996)

#### **2401-11-28 Continuation of Permitted Conduct**

During the time period when such a permit application is pending before the EQPB, the discharges authorized by the NPDES Permit (as adopted as an EQPB Pollutant Discharge Permit) may continue, notwithstanding any expiration date on the permit. Once, however, the EQPB issues a new Pollutant Discharge Permit as a result of the application required by Section 2401-11-27, all authorizations to discharge pollutants under the NPDES Permit (as adopted as an EQPB Pollutant Discharge Permit) shall cease.

(Effective May 26, 1996)

#### **2401-11-29 Compliance With Law Required**

Nothing in these regulations shall be construed to allow any person to avoid the requirements of the Environmental Quality Protection Act, and the Regulations promulgated thereunder, including but not limited to the Sections 2401-11-21 and 2401-11-22 of the Marine and Fresh Water Quality Regulations requirement that prior written authorization and appropriate permits be obtained from the EQPB prior to the initiation of any project that may represent a new or increased source of either point-source or non-point source pollution.

(Effective May 26, 1996)

### **MIXING ZONES**

#### **2401-11-30 Applicability and Limits**

(A) The water quality standards and criteria set forth in Sections 2401-11-9 through 2401-11-19 may apply within a mixing zone unless specific alternative criteria have been approved by the Board.

(B) Mixing zones will not be granted in lieu of reasonable control measures to reduce point source pollutant discharges but will be granted to compliment the applicable controls.

(Effective May 26, 1996)

#### **2401-11-31 Permit Required**

(A) All new point source discharges beginning after December 1, 1990 shall apply for an EQPB Pollutant Discharge Permit. This permit shall be required even if it can be demonstrated that the discharge will meet the applicable water quality standards at the point of discharge.

(B) It shall be a violation of these regulations for any person to commence discharging from a new point or non-point source without first obtaining all required permits.

(Effective May 26, 1996)

(C) *All point and non-point discharges subject to the provisions of this Chapter shall comply with the terms, conditions, provisions and management plans for any National, State or traditional conservation area, preserve or other protected area as established by law.\**

*\*(Amendment Effective March 12, 1999)*

#### **2401-11-32 Mixing Zone Application**

(A) Any application for a zone of mixing must contain the following:

(1) Evidence that the EQPB Pollutant Discharge Permit has been applied for and will be obtained;

(2) A description of the waste to be discharged including flow rate and pollutant types and quantities;

(3) The location of the discharge and a description of the disposal methods (e.g. outfall size, number and type of diffusers, etc.);

(4) Evidence that the concentration of toxic substances present in the discharge will not violate water quality standards for toxic substances;

(5) Identification of those substances for which the mixing zone is required;

(6) A certification for each substance identified in these regulations that after initial mixing the concentration of the substance will not exceed the applicable water quality standard. The following equation shall be used to calculate concentration after initial dilution:

$$C_f = \frac{C_c + C_b (D_x)}{(D_x + 1)}$$

$C_f$  = Concentration after mixing

$C_c$  = Effluent concentration (instantaneous maximum)

$C_b$  = Background concentration

$D_x$  = Dilution ration



(7) Evidence that the basic water quality standards (Section 2401-11-9 through 2401-11-19, inclusive) will not be violated within the mixing zone;

(8) A proposed schedule of effluent and receiving water monitoring to determine compliance with the proposed mixing zone;

(9) A technical justification why a mixing zone should be permitted; and,

(10) Any other information required by the Board.

(B) The mixing zone shall be defined under those conditions of tide, wind, runoff, density stratification and discharge that would result in the minimum dilution.

(Effective May 26, 1996)

#### **2401-11-33 Existing Discharges**

All existing point source discharges must apply to the Board for a mixing zone or demonstrate that one is not required not later than June 1, 1992. The application procedure is identical to the one for new sources.

(Effective May 26, 1996)

#### **2401-11-34 False or Misleading Information Prohibited**

It shall be in violation of these standards for any person to knowingly present false or misleading information to the Board in an application for a mixing zone.

(Effective May 26, 1996)

#### **2401-11-35 Mixing Zone Application Review**

(A) In reviewing a mixing zone application the Board will consider:

(1) Present and anticipated uses of the water body.

(2) Whether an adequate zone of passage will exist for the movement of aquatic life.

(3) The proximity of other mixing zones.

(4) Whether the granting of a mixing zone is in the public interest.

(B) The Board may request additional information from the applicant that is deemed relevant to the Board's determination.

(Effective May 26, 1996)

#### **2401-11-36 Mixing Zone Certification Determination**

(A) The Board may either approve, conditionally approve or disapprove a mixing zone application after conducting a public hearing on the application. The Board will notify the applicant in writing of its determination. The notification will include, but is not limited to:

(1) The duration of the mixing zone; and,

(2) Any conditions placed upon the Board's approval of the application. Conditions may include, but are not limited to:

(a) Effluent and receiving water monitoring and reporting requirements;

(b) A timetable for the reduction or elimination of the discharge; and,

(c) The parameters for which the mixing zone is being granted and the alternative criteria that will apply within the mixing zone.

(B) If the Board disapproves a mixing zone application, it will notify the applicant, in writing, of the reasons for the disapproval.

(Effective May 26, 1996)

### **MARINE SANITATION DEVICES**

#### **2401-11-37 Definitions**

Unless specifically indicated otherwise, or unless the context clearly requires a different meaning, for the purposes of Sections 2401-11-37 and 2401-11-38:

(A) "Discharge" includes, but is not limited to, any spilling, leaking, pumping, pouring, emitting, emptying, or dumping.

(B) "Federal Water Pollution Control Act" means the U.S. Federal Water Pollution Control Act Amendments of 1972, 82 Stat. 886, 33 U.S.C. 1251, *et seq.*, as amended by the Clean Water Act of 1977, 91 Stat. 1566, 33 U.S.C. 1251, *et seq.*, and the Water Quality Act of 1987, 101 Stat. 7, 33 U.S.C. 1251, *et seq.*

(C) "Marine Sanitation Device" includes any equipment for installation on board a vessel and which is designed to receive, retain, treat, or discharge sewage and any process to treat such sewage.

(D) "Sewage" means human body wastes and the wastes from toilets and other receptacles intended to receive or retain body wastes.

(E) "Vessel" includes every description of watercraft or other artificial contrivance used, or capable of being used, as a means of transportation on any waters of or within the Republic of Palau.

(F) Other terms shall have the Definitions set forth in 40 CFR Section 140.1 and 33 CFR Section 159.3

(Effective May 26, 1996)

#### **2401-11-38 Marine Sanitation Device Requirements**

All Marine Sanitation Device requirements in effect within the Republic of Palau on September 29, 1994, as set forth in 33 CFR Part 159 and 40 CFR Part 140 shall continue in effect after the implementation of the Compact of Free Association between the Republic of Palau and the United States of America and are hereby adopted by reference and no discharge of sewage pertaining to vessels shall occur within the Republic of Palau in violation of said Marine Sanitation Device Requirements.

(Effective May 26, 1996)

**SPILL PREVENTION CONTROL AND  
COUNTERMEASURES (SPCC)**

**2401-11-39 Applicability**

Sections 2401-11-39 through 2401-11-41 apply but are not limited to all facilities that, on September 29, 1994, were subject to the SPCC requirements of USEPA. This includes, but is not limited to all bulk petroleum product storage facilities within the Republic of Palau.

(Effective May 26, 1996)

**2401-11-40 Definitions**

Unless specifically indicated otherwise, or unless the context clearly requires a different meaning, for the purposes of this Section,

(A) "Owner or Operator" means any person owning or operating an on-shore facility or an off-shore facility, and, in the case of an abandoned facility, any person that owned or operated the facility immediately prior to abandonment.

(B) "SPCC Plan" means the Spill Prevention Control and Countermeasure Plan required pursuant to 40 CFR Part 112.

(Effective May 26, 1996)

**2401-11-41 SPCC Requirements**

(A) The SPCC Plan and oil spill requirements of 40 CFR Parts 110, 111 and 112 are hereby adopted by reference, except that the Board shall have the authority to take any action or impose any requirement that said Parts of the CFR authorize the Administrator to take or impose.

(B) Any person that owns or operates any facility, whether off-shore or on-shore, shall complete, maintain, and, as either necessary or as required by the EQPB, revise the SPCC plan for that facility to the same extent required by 40 CFR Parts 110, 111 and 112.

(Effective May 26, 1996)

**WATER USE AREAS:  
CLASSIFICATION AND ESTABLISHMENT**

**2401-11-42 Surface Waters**

The following classification of water uses shall apply to the following areas:

- (A) Babeldaob
  - (1) Class AA: All areas not otherwise classified and those coastal waters not having a specific water use classification are considered Class AA Waters.
  - (2) Class B: Village Docks
- (B) Koror
  - (1) Class AA: All areas (not otherwise classified)

- (2) Class A:
  - (a) Meyuns
  - (b) Echang
  - (c) Cholebdechal (Oleblechol)
  - (d) Ngiritang
  - (e) M-Dock (Singhatoba) Point
  - (f) Ngetmeduch
  - (g) Mechang
- (3) Class B:
  - (a) Malakal (Ngemelachel) Harbor
  - (b) M-Dock (Singhatoba) including S.E. of Ngerbeched Shore
  - (c) Kemangel Toachel, excluding T-Dock (Ngerkemais)
  - (d) Metukerademul to E. side of old Japanese Dock (Derromel)
  - (e) Ngereksong
  - (f) *Nikko (Iwayama) Bay from the Nikko pier to a shoreline boundary approximately 1200 feet N.W. of the Nikko pier and an additional 300 feet of offshore reef flat to the N.W. of the shoreline boundary.\**
  - (g) *Waters extending 200 meters from the shoreline of Ngerur Island.\*\**
- (C) Peleliu
  - (1) Class AA: All areas (not otherwise classified)
  - (2) Class A:
    - (a) Ngebad to Ngarekeiukel point
    - (b) Southern side of island
  - (3) Class B: Akalakul (Elochel) Dock
- (D) Angaur
  - (1) Class AA: All areas (not otherwise classified)
  - (2) Class A:
    - (a) Pkulamekaep (Bkulamekaeb) point to Medorm Beach south of Pkulagelul (Bkulengeluul) point
    - (b) Beach between Ngedeloch point and Medorm
  - (3) Class B: Angaur (Ngeaur) Harbor
- (E) Sonsorol
  - (1) Class AA: All areas (not otherwise classified)
- (F) Tobi
  - (1) Class AA: All areas (not otherwise classified)
- (G) Merir
  - (1) Class AA: All areas (not otherwise classified)
- (H) Pulo Anna
  - (1) Class AA: All areas (not otherwise classified)

(Effective May 26, 1996)

\* (Amendment Effective May 18, 1998)

\*\* (Amendment Effective October 6, 2000)

**2401-11-43 Groundwater Areas**

The following classification of water uses shall apply to the following areas:

- (A) Class I Groundwater: All sources of fresh groundwater on all islands, whether publicly or privately owned, used or potentially used, for domestic, culinary or food processing purposes.
- (B) Class II Groundwater: All fresh groundwater not included in Class I and Class III.
- (C) Class III Groundwater: All groundwater not considered potential sources of drinking water and of limited beneficial use which are heavily saline, with total dissolved solids levels over 10,000 mg/l or which are

otherwise contaminated beyond levels that allow cleanup using methods reasonably employed in public water system treatment.  
(Effective May 26, 1996)

certification and/or permit for which certification is sought.  
(Effective May 26, 1996)

## **WATER QUALITY CERTIFICATION**

### **2401-11-44 Permits/Licenses Subject to Certification**

(A) Water quality certification must be provided by the Board prior to the issuance of any EQPB Permits or any permits required by Sections 402 and 404 of the United States Clean Water Act (33 U.S.C. Sections 1342 and 1344) and section 10 of the United States Rivers and Harbors Act, approved March 3, 1899, (33 U.S.C. 403).

(B) A Republic of Palau Foreign Investment Board license may also be required in order to receive water quality certification.

(Effective May 26, 1996)

### **2401-11-45 Scope of Work**

The scope of review of applications for certification shall be sufficient to determine that no permit would violate water quality standards or become a source of pollution in the future. Such review shall include an examination of but not limited to the following:

(A) Impact on water quality at the proposed project site;

(B) Impacts on water quality of any or all waters influenced by the project, including groundwater, downstream and upstream waters, tidal influenced water or other fresh, marine, or brackish water influenced by the project as a result of topography, percolation, recharge, currents or other hydrologic and geologic conditions;

(C) Impacts of operation of the project on water quality at site and influenced waters as described in Division B; and

(D) All criteria and standards included in these regulations shall be considered.

(Effective May 26, 1996)

### **2401-11-46 Approval Criteria**

(A) No certification shall be issued in violation of the national policy set forth in Section 2401-11-03 of these regulations.

(B) Certification of projects which are not water dependent shall be denied.

(C) Certification of non-water dependent projects for which there is a viable alternative shall be denied.

(D) Certification is denied if the project will prevent or interfere in the maintenance of applicable water quality standards.

(E) Certification is denied if impacts to water quality can not be made acceptable through conditioning of the

### **2401-11-47 Conditioning of the Certification**

(A) The Board shall place any conditions on a water quality certification that are necessary to assure the applicant will comply with water quality standards, effluent limitations, and with any applicable Republic of Palau or its State's Laws or Regulations.

(B) Conditions shall include, but are not limited to:

(1) structural and nonstructural mitigation measures;

(2) appropriate effluent treatment systems;

(3) appropriate operations and maintenance plans;

(4) compensation to the fullest extent possible for functional losses to the local ecosystem by the unavoidably lost wetlands; and,

(5) compensation for the loss of certain areas with the permanent preservation of other similar ecosystems.

(Effective May 26, 1996)

### **2401-11-48 Contents of Certification**

A certification made by the Board shall include the following:

(A) The name and address of the applicant;

(B) A statement that the Chairman has either:

(1) Examined the application made by the applicant to the licensing or permitting agency (specifically identifying the number or code affixed to such application) and bases the certification upon an evaluation of the information contained in such application which is relevant to water quality considerations; or,

(2) Examined other information furnished by the applicant sufficient to permit the Chairman to make the statement described in Subdivision 1 above;

(C) A statement that there is a reasonable assurance that the activity will be conducted in a manner which will not violate applicable water quality standards;

(D) A statement of any conditions which the Chairman deems necessary or desirable with respect to the discharge of the activity; and,

(E) Such other information as the Chairman may determine to be appropriate.

(Effective May 26, 1996)

### **2401-11-49 Standard For Certification**

If, after considering the complete application, comments received during the public comment period, the record of any public hearing held pursuant to 24 PNC Section 162 and other information and data as the Chairman deems relevant, should the Chairman determine that there is a reasonable assurance that applicable water quality standards will not be violated and the best practicable methods of control will be

applied to a discharge which is the result of any activity including, but not limited to, the construction and operation of facilities, then the Chairman shall so certify.

(Effective May 26, 1996)

#### **2401-11-50 Certification Modification**

The Chairman may modify the certification prior to the issuance of any applicable license or permit, after consideration of information presented by the applicant, licensing or permitting agency or other government agencies or interested parties.

(Effective May 26, 1996)

#### **2401-11-51 Contents of Application**

(A) An applicant for certification shall submit a complete description of the discharge involved in the activity for which certification is sought, with a request for certification signed by the applicant. Such description shall include the following:

- (1) The name and address of the applicant;
- (2) A description of the facility or activity, and of any discharge into the Republic of Palau waters which may result from the conduct of any activity including, but not limited to the construction or operation of the facility, including characteristics of the discharge, and the location or locations at which such discharge may enter waters of the Republic;
- (3) If applicable, a description of the function and operation of equipment or facilities to control discharges, including specification of the methods of control to be used;
- (4) The estimated date or dates on which the activity will begin and end the date or dates on which the discharge(s) will take place;
- (5) If applicable, a description of the methods and means being used or proposed to monitor the quality and characteristics of the discharge and the operation of equipment or facilities employed in the control of the proposed discharges;

(B) The Chairman may require the submission of additional information after a certification application has been filed, and shall insure that, if the certification application is incomplete or otherwise deficient, processing of the application shall not be completed until such time as the applicant has supplied the missing information or otherwise corrected the deficiency. The Chairman shall notify the applicant, in writing, within thirty (30) days of the submission of an application, if an application is incomplete or otherwise deficient. A description of the type of additional information necessary to complete the application or correct the deficiency will be included with such a written notice. Failure to provide additional information or to correct a deficiency shall be sufficient grounds for denial of certification.

(C) The applicant will be informed, in writing, by the Chairman, when a certification application is considered to be complete. The Chairman shall act on a request for certification within a period which shall not exceed three (3) months;

(D) The applicant is required to notify the Board immediately, in writing, of changes which may effect the application and certification process:

(E) Fees shall be made payable to the National Treasury. The Republic and its State governments and agencies are exempt from paying filing fees.

(Effective May 26, 1996)

#### **2401-11-52 Notice and Hearing**

(A) The Chairman may, upon request, provide the opportunity for a public hearing(s) to consider the issuance of a water quality certification. A notice shall be published in accordance with 24 PNC Section 162.

(B) The Chairman shall inform the applicant, in writing, that such action has been taken.

(C) All publication costs related to public hearing(s) notification(s) shall be paid by the applicant to the necessary and appropriate newspaper agency(ies) prior to publication date. Failure to do so may result in a delay in the certification process beyond three (3) months.

(Effective May 26, 1996)

#### **2401-11-53 Waiver**

If the discharge in question is the result of activities which receive a nationwide permit for the discharge of dredge and fill materials, thereby fulfilling specific conditions of that permit pursuant to 24 PNC Section 162, then the Chairman will determine, on a case-by-case basis, which projects are considered to be minor, with a negligible impact and non-controversial. Certification requirements of this section shall be waived for minor projects which have a negligible impact, and are non-controversial activities within three (3) months of the receipt of a completed application.

(Effective May 26, 1996)

#### **2401-11-54 Effect of New Standards on Permitted Activity**

The Board shall review any project or activity wherever:

(A) A license or permit was issued without certification due to the absence of applicable water quality standards;

(B) Water quality standards applicable to the waters into which the licensed or permitted activity may discharge are subsequently established before the activity is completed; and,

(C) The Board determines that such uncertified activity is violating water quality standards.

(Effective May 26, 1996)

### **ENFORCEMENT**

#### **2401-11-55 Enforcement**

Any person in violation of any of the provisions of these regulations shall be subject to enforcement and court action under 24 PNC Sections 161 through 172, inclusive.

(Effective May 26, 1996)

**MISCELLANEOUS PROVISIONS**

**2401-11-56 Severability Clause**

If any provisions of these regulations or the application of any provision of these regulations to any person or circumstances is held invalid, the application of such provision to other persons or circumstances and the remainder of these regulations shall not be effected thereby.

(Effective May 26, 1996)

**2401-11-57 Repealer**

The regulations contained herein shall replace the Republic of Palau EQPB Marine and Fresh Water Quality Standards Regulations in effect upon the effective date of these regulations.

(Effective May 26, 1996)

**2401-11-58 Protected Areas**

*All activities subject to the provisions of this Chapter shall comply with the terms, conditions, provisions and management plans for any National, State or traditional conservation area, preserve or other protected area as established by law.\**

*\*(Amendment Effective March 12, 1999)*

**AMENDMENT TO REPUBLIC OF PALAU MARINE AND FRESHWATER  
QUALITY REGULATIONS, CHAPTER 2401-11-05**

Chapter 2401-11-05 is amended by repealing and replacing (C) and adding a new (D) to read:

2401-11-05 Classification of Coastal Water Uses

(C) Class B Waters

(1) The uses to be protected in this class of waters are small boat harbors, commercial and industrial shipping, bait fishing, compatible recreation, over-water commercial or residential structures for recreational or domestic use, resource extraction, the support and propagation of aquatic life, and aesthetic enjoyment.

(2) It is the objective for this class of waters that discharge of any pollutant be controlled to the maximum extent possible and that sewage and industrial effluent receive the highest degree of treatment practicable under existing technological and economic conditions, and shall be compatible with the standards established for this class.

(3) The Class B designation should apply only to a limited area next to boat docking facilities. No new coastal areas with a coastal mangrove fringe greater than 50 feet in width shall be classified as class B waters after May 18, 1998.

(4) Unless the boundaries of a Class B area are specifically identified, the area is limited to those waters within 1000 feet of a boat docking facility. The rest of the water area in such bay or harbor not falling within the area identified above shall be Class A unless given some other specific designation.

(D) Class BB Waters

(1) The uses to be protected in this class of waters are sand mining, compatible recreation, the support and propagation of aquatic life, and aesthetic enjoyment.

(2) It is the objective of this class of waters that sand mining be allowed but in such a manner and at such times as to minimize impacts on other uses. Discharges of sediment associated with sand mining shall be controlled to the greatest extent practicable under existing technological and economic conditions, and any live or intact coral within the area shall not be disturbed.

(3) The Class BB designation shall apply only to clearly identified and delineated areas and shall be limited to areas that contain little or no coral and which have not been identified as providing important habitat for the support and propagation of aquatic life.

(4) A baseline study, as required under Chapter 2401-1-07 shall be conducted and provided to the Board before the Board will designate an area as Class BB.

Effective Date: 4/12/2002

Certification of Adoption: 

Paula R. Holm, Chairperson  
Environmental Quality Protection Board

**AMENDMENT TO THE REPUBLIC OF PALAU MARINE AND FRESH  
WATER QUALITY REGULATIONS**

Pursuant to 24 PNC § 129, and having met the requirements of the Administrative Procedure Act, 6 PNC § 101 et seq., the Environmental Quality Protection Board hereby amends the Marine and Fresh Water Quality Regulations, Water Use Areas: Classification and Establishment, Chapter 2401-11-42 Surface Waters at (B)(3) to add (h) Bkul Echol as follows:

WATER USE AREAS: CLASSIFICATION AND ESTABLISHMENT

2401-11-42 Surface Waters

The following classification of water uses shall apply to the following areas:

- |                |       |
|----------------|-------|
|                | * * * |
| (B) Koror      | * * * |
| (3) Class B    | * * * |
| (h) Bkul Echol |       |

**An area of approximately 17,050 square meters starting from the corner boundary between Cadastral Lot No. 025 A 02 and Cadastral Lot No. 025 A 04 and then proceeding west one hundred and ten (110) meters to the eastern boundary of Cadastral Lot No. 25-A-01 (Ngeriungs Island) and then proceeding in a northerly direction parallel to the western boundaries of Cadastral Lot Nos. 025 A 04, 025 A 05, 024 A 04, and 024 A 03 for one-hundred and seventy-five (175) meters and then east to the shoreline.**

Certification  
Of Adoption:



\_\_\_\_\_  
Earnest Ongidobel, Vice Chairman  
Environmental Quality Protection Board

Adoption Date:

9/17/09

Presidential  
Approval:



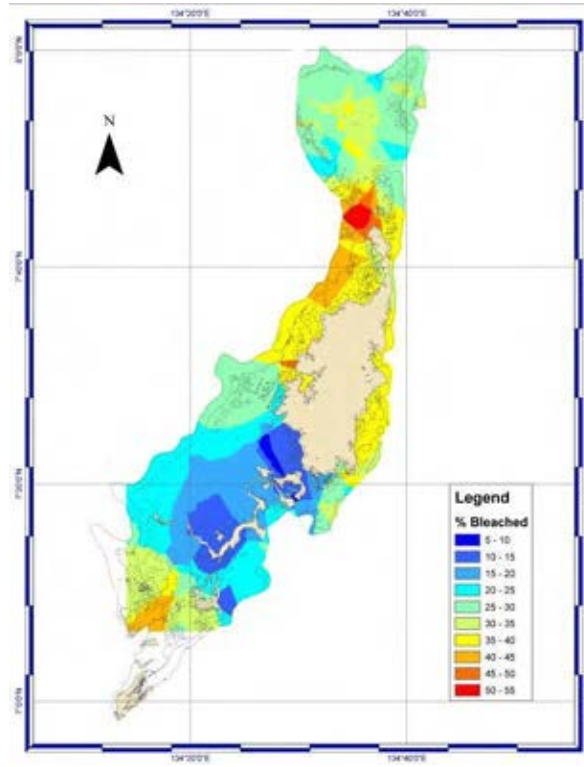
\_\_\_\_\_  
His Excellency Johnson Toribiong, President  
Republic of Palau

Approval Date:

9/22/09

# Spatial variability of coral bleaching in Palau during a regional thermal stress event in 2010

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## **Executive summary**

Thermal stress continues to emerge as a global concern for coral reefs. Yet, most studies are site specific. There are few studies that examine the spatial variability of bleaching response during thermal stress events. This study examined the spatial extent and severity of bleaching in Palau during a regional thermal stress event in 2010. We surveyed coral bleaching at 80 sites using a stratified-random sampling design in July-August 2010. Our objective was to determine whether there were any spatial differences in thermal stress that were habitat or taxa dependent. Coral bleaching was significantly higher on outer and patch reefs than in the bays, and was particularly severe in the northwestern lagoon. While the reefs in the bays may provide a safe haven for some coral species through climate change, these reefs, alone, are not resilient because they are more vulnerable to land-use change than patch and outer reefs. Therefore, protecting nearshore reefs from local disturbances may help buffer the coral reefs of Palau against climate-change induced disturbances.

## Introduction

Reef corals are particularly sensitive to increases in water temperature. Corals pale when temperatures are elevated a few degrees above the average seasonal maximum (Glynn 1991). If high temperatures are sustained for several weeks the most temperature-sensitive corals will bleach, losing their endosymbionts and their autotrophic capacity (Hoegh-Guldberg 1999). These corals may subsequently die of starvation (Glynn 1993, Brown 1997; Fitt *et al.* 2001). Coral bleaching events are becoming more frequent as the oceans continue to warm (Hoegh-Guldberg 1999; Hughes *et al.* 2003), and these events are expected to increase in intensity over the coming decades (Hoegh-Guldberg *et al.* 2007; Baker *et al.* 2008).

In 2010, western Micronesia experienced a thermal stress event - with recorded sea surface temperatures as high as 1.5°C above average (Figures 1-3). The earliest signs of bleaching were reported in late June 2010. The outer southwestern barrier reefs of Palau showed paling of some coral species. By mid-July, more extensive bleaching was observed. This study was designed to examine the intensity of thermal stress with the extent of bleaching severity and mortality in Palau (Figure 4). There are few records on the spatial variability of bleaching during a regional thermal stress event (but see McClanahan *et al.* 2007; Wagner *et al.* 2010), as most studies are site specific assessments of stress (Loya *et al.* 2001; van Woesik *et al.* 2011).

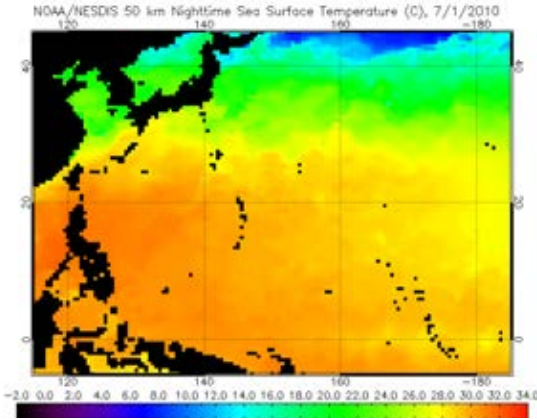


Figure 1. Sea surfaces temperatures in Micronesia, 1 July, 2010.

Coral bleaching and mortality is dependent on the intensity and duration of the temperature stress. For example in 1998 reefs in southern Japan that were exposed to temperatures 3°C above the summer mean lost nearly 85% of the corals (Loya *et al.* 2001), showing major long-term transitions in species composition (van Woesik *et al.* 2011). Whereas in the same year, nearby reefs exposed to temperatures 1.8°C above the summer mean showed only subtle, mortality induced, shifts in size-frequency distributions (Roth *et al.* 2010). Although coral bleaching and mortality is dependent on the intensity and duration of the temperature stress, bleaching is also dependent on a number of other

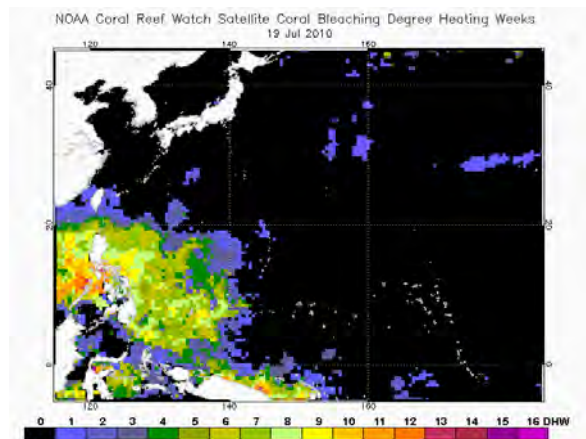


Figure 2. Degree heating weeks 19 July 2010.

variables including: (i) the composition of the coral community that is subjected to the thermal stress (Loya *et al.* 2001; McClanahan 2004), (ii) the daily and seasonal variation in temperature to which the reef corals are exposed (McClanahan and Maina 2003), (iii) the recent history in exposure to irradiance (Dunne and Brown 2001; Mumby *et al.* 2001; Brown *et al.* 2002), and (iv) the exposure to high concentrations of dissolved inorganic nitrogen concentrations (Wooldridge and Done 2009; Wagner *et al.* 2010).

Reefs under the same temperature stress, supporting different coral species, show different responses (McClanahan 2004). For example, reefs supporting mainly pocilloporids and acroporids are more likely to bleach than reefs supporting faviids and massive *Porites* (van Woesik 2001). Given the same species composition, the extent of thermal tolerance is also dependent on geographic locality and habitat type. Biogeographic regions experience temperature ‘zones’, upon which natural selection has acted (Craig *et al.* 2001; Smith-Keune & van Oppen 2006; Barshis *et al.* 2010). Such adaptations determine the temperature tolerances of the coral populations. For example, the corals in the northern Great Barrier Reef experience average temperatures of ~28.5°C in the warmest months, whereas corals in the southern Great Barrier Reef rarely experience temperatures above 27°C (Smith-Keune & van Oppen 2006; Wooldridge and Done 2009). Therefore, it is no surprise that under a regional temperature stress event in 1998, the northern nearshore reefs, which were adjusted to warmer temperatures, showed less bleaching than the southern nearshore reefs (Berkelmans and Oliver 1999).

The differential responses imposed by habitat characteristics may also play a role in the response of corals to thermal stress. For example, corals on reef flats that experience daily temperature fluctuations that can exceed 6°C are less likely to bleach during regional temperature increases than corals in habitats with lower temperatures fluctuations (Maina and McClanahan 2003). Clearly, acclimation to dynamic, eurythermal conditions makes corals more tolerant to regional thermal stress. The extent to which corals bleach under temperature stress is also highly dependent on the intensity of irradiance (Iglesias-Prieto *et al.* 1992; Brown *et al.* 2002; Takahashi *et al.* 2004). Suspended particles in nearshore environments are known to reduce irradiance (Golbuu *et al.* 2007), which in turn can reduce bleaching susceptibility. For example, Wagner *et al.* (2010) showed that nearshore corals growing in turbid conditions with low irradiance were less prone to bleaching, despite homogeneously elevated temperatures. Notably, localities with high nutrient concentrations were exceptions to these trends and showed extensive

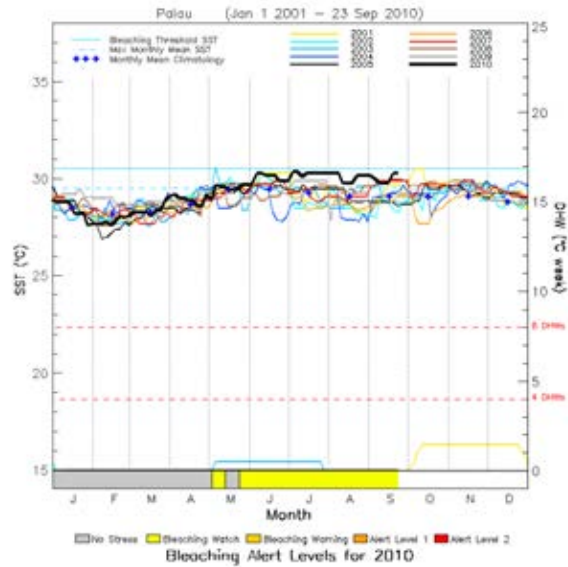


Figure 3. Annual sea surface temperatures for Palau from 2001 to 2010.

bleaching. A similar response was observed on the Great Barrier Reef, where Wooldridge and Done (2009) suggested that corals in localities with low- water quality, measured as high satellite-derived-chlorophyll-a concentrations, were more likely to bleach in 1998 and in 2002 than corals in localities with high-water quality.

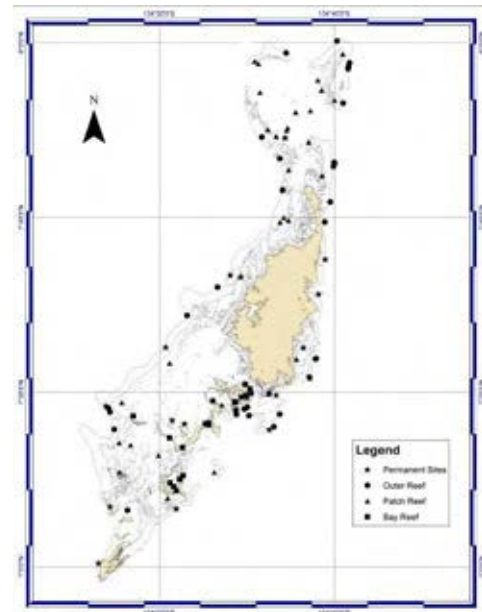
In 1998, the reefs of Palau were subjected to extensive thermal stress and widespread coral mortality (Bruno *et al.* 2001). Bruno *et al.* (2001) sampled nine sites, six of which were in the sheltered lagoon around the Rock Islands, and three of which were on outer reefs. While comprehensive datasets were collected at each site, the study was conducted in November, 1998, two months after the temperatures peaked, and the most vulnerable species may have already died. Moreover, the study was not spatially extensive enough to identify localities that may have tolerated thermal stress. Here we study the spatial variation in the extent of coral bleaching during a moderate regional thermal stress event in 2010, when the sea surface temperatures were 1.5°C above average. The main objectives of this study were to determine whether (i) there were any spatial differences in thermal stress in Palau in 2010, (ii) which corals were most thermally tolerant, and (iii) whether colony size influenced the probability of bleaching. The study addresses whether, in the face of climate change, a coral-reef system, such as Palau, could prioritize conservation resources toward specific localities, some of which may tolerate regional thermal stress events better than other localities.

## Methods

### *Study location and environmental variables*

Palau is located in western Micronesia (07° 30 N, 134° 30 E) (Fig. 4). The archipelago is about 700 km long. We focused our efforts on the reefs in the vicinity of the main island of Babeldaob, which supports outer barrier, patch, and fringing reefs in bays (Golbuu *et al.* 2007) (Fig. 4).

We undertook a rapid assessment of the extent of coral bleaching from 28 July to 12 August, 2010. We used a stratified-random sampling approach to differentiate the reefs as either: (i) bays, (ii) patch reefs, and (iii) outer reefs. Stratification of Palau's reef habitats was based on the 2005, National Oceanic and Atmospheric Administration (NOAA) benthic habitat maps of Palau (Battista *et al.* 2007). The habitat shapefiles were accessed using Arc9.3® from which random points were selected using the Hawth's-extension toolbox (Hawth's® 2009). We pre-selected random points for each habitat, surveying 30 sites on the outer reefs, 30 sites on the patch reefs, and 20 sites in the bays (Fig. 1). The survey targeted the shallow coral-reef assemblages between 2-5 m, primarily



**Figure 4.** Eighty study sites, stratified by bays (n=20), patch reefs (n=30), and outer reefs (n=30) that were examined for coral bleaching in July 2010.

because we wished to adequately survey the most species-rich strata. Within each site, we haphazardly laid down 3 x 30 m fiberglass transect tapes, and took 30, 1 m<sup>2</sup> photographs along each transect. Within each photo frame, each coral colony, with its center inside the 1 m<sup>2</sup> frame, was identified and measured to the nearest centimeter, and assessed for the extent of bleaching, as either (i) no bleaching, (ii) pale, or (iii) bleached. Some coral colonies simultaneously showed all three responses, which were reported as percentages. We focused our spatial analyses on colonies that were > 50% bleached. In total 34,397 coral colonies were assessed for bleaching in Palau during the 2010 thermal stress event.

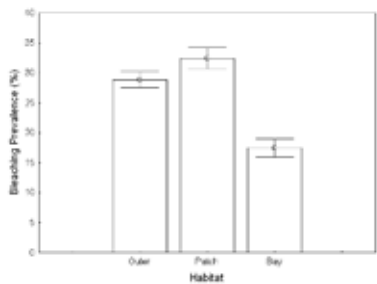
#### Data analysis

To examine whether the thermal stress caused differential mortality, we calculated the first difference in coral cover across sequential sampling periods. These data were analyzed using General Linear Models. We examined the raw data for violations of normality using normal probability plots, and violations of homogeneity of variances using the Levene's test. Bleaching prevalence was also spatially interpolated for the entire sampling domain using kriging, by applying Gaussian functions for best-fit modeling (Wagner *et al.* 2008).

## Results and Discussion

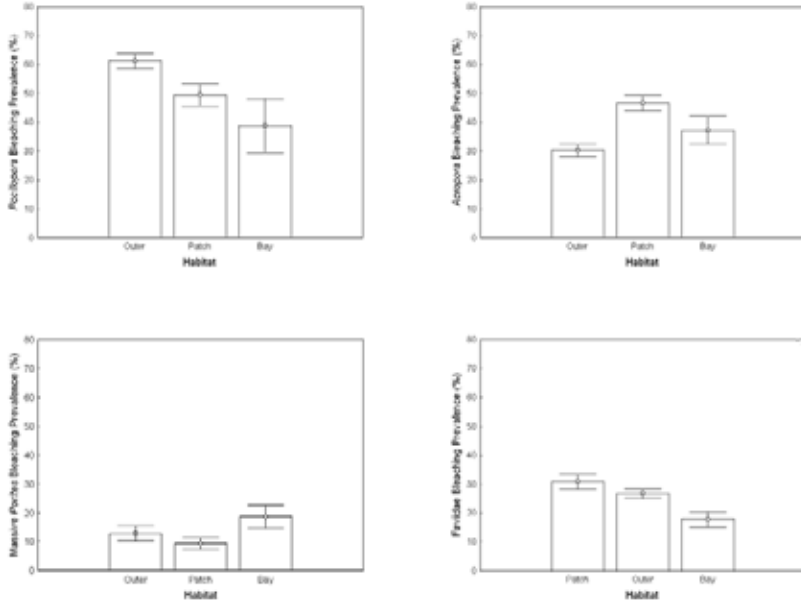
### Bleaching prevalence

The study focused on bleaching prevalence, in order to determine the proportion of the population which was bleached, and thereby accounting for differences in coral colony densities



**Figure 4.** Bleaching prevalence, which is the proportion of colonies that bleached within each population, stratified by habitat type, for the thermal stress event in Palau in 2010.

across habitats. Coral bleaching was significantly higher on outer reefs ( $5.2 \pm 0.1$ , mean  $\pm$  standard error) and patch reefs ( $5.4 \pm 0.2$ ) than in the bays ( $3.9 \pm 0.20$ ) (one-way ANOVA,  $p < 0.001$ ); Fig. 4). Similarly, there was significantly higher bleaching of *Pocillopora* on the outer reefs than in the bays (ANOVA,  $p < 0.001$ ; Fig. 5a). There were no significant differences however in bleaching of *Acropora* and *Porites* colonies among habitats (Figs. 5b & 5c). Faviids showed a similar bleaching trend as *Pocillopora*, with significantly less bleaching in the bays than on patch and outer reefs (Fig. 5d). There was no relationship between bleaching prevalence and coral colony size across all habitats.



**Figure 5.** Bleaching prevalence, which is the proportion of colonies that bleached within each population, stratified by habitat type, for *Pocillopora* (top left), *Acropora* (top right), *Porites* (bottom left), and faviids (bottom right).

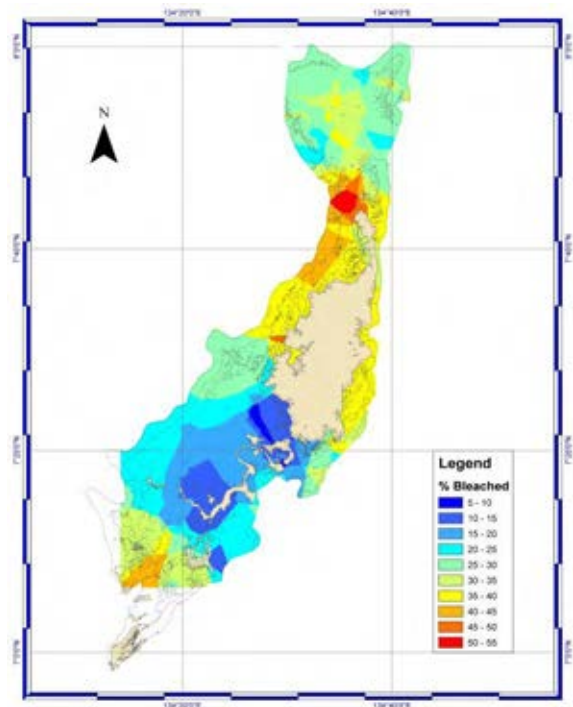
less irradiance than corals on outer reefs (see Golbuu et al 2007, their Figure 4). High volcanic islands, in general, have a high variance in the intensity and duration of incoming irradiance (Iwase *et al.* 2008). These different levels of irradiance influence not only coral morphology, but may also cause different intensities of bleaching under the same thermal stress.

### Conservation

Still, a higher temperature tolerance nearshore does not suggest that the reefs are resilient. Nearshore reefs are also more affected by land-use change than outer barrier reefs (Golbuu *et al.* 2011). While outer reefs are somewhat removed from direct land-use change, these outer reefs are also more vulnerable to temperature stress events. Therefore, incorporating reefs from a variety of habitat types into conservation plans, and reducing river run-off to the nearshore reefs becomes even more pertinent as we strive to optimize conservation

### Islands and persistent corals

The present study shows that habitats respond differently to thermal stress, and that regional persistence is not simply about water temperature. The nearshore reefs of Palau had less bleaching and mortality than the outer barrier and patch reefs, even though the temperatures were as high, if not higher, in the bays. The duration and intensity of irradiance also plays a major role in whether corals bleach or not. Experimental studies show that low irradiance under temperature stress reduces the likelihood of bleaching (Iglesias-Prieto *et al.* 1992; Takahashi *et al.* 2004). Indeed, corals in bays experience



**Figure 6.** Bleaching prevalence in Palau in July-August, 2010.

plans under climate-change scenarios.

The study shows that reefs around bays are indeed more tolerant to thermal stress than patch and outer reefs, and the reefs in the bays are therefore valuable refuges to buffer coral-reef ecosystems against climate-change induced disturbances.

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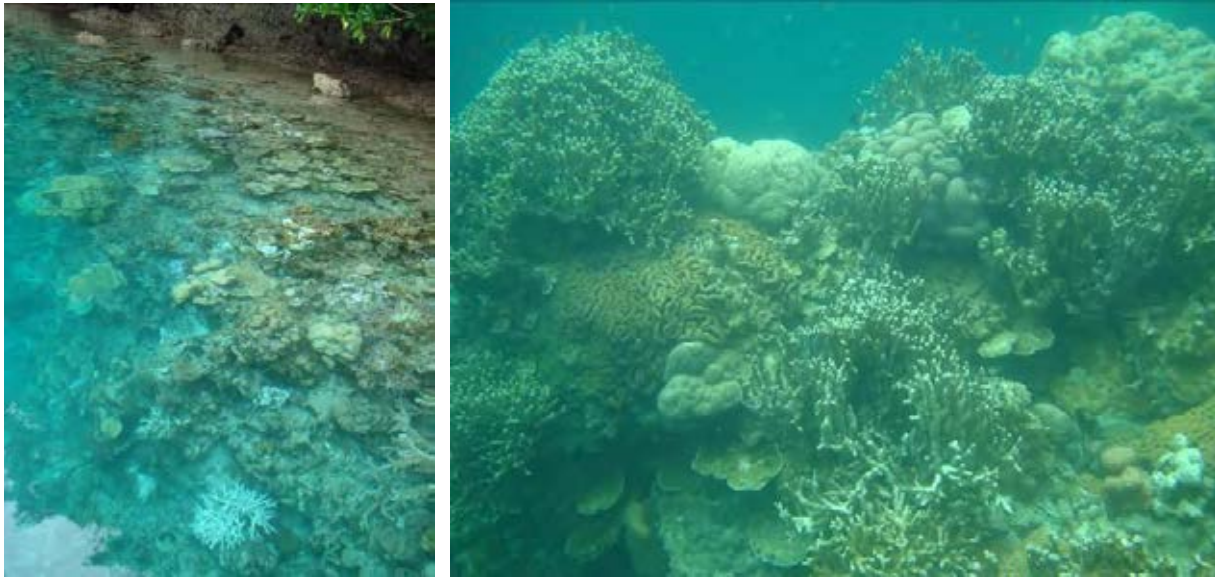
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**Figure 8.** Bleaching in Bay, August 1, 2010.



**Figure 9.** Bleaching on patch reefs, August 3, 2010, 2010; (top) Ebill, and (bottom) Lukes.

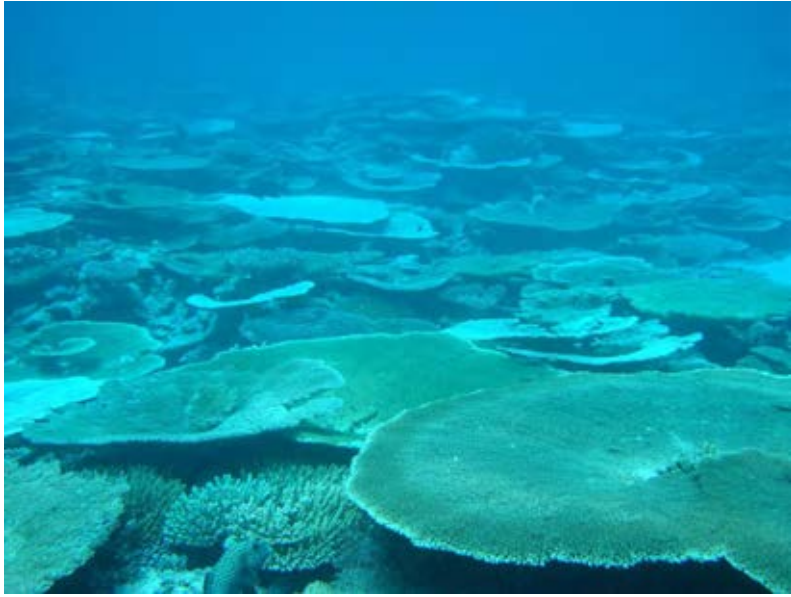


Figure 10. Bleaching on outer reefs, August 3, 2010; top (west), and bottom (east).

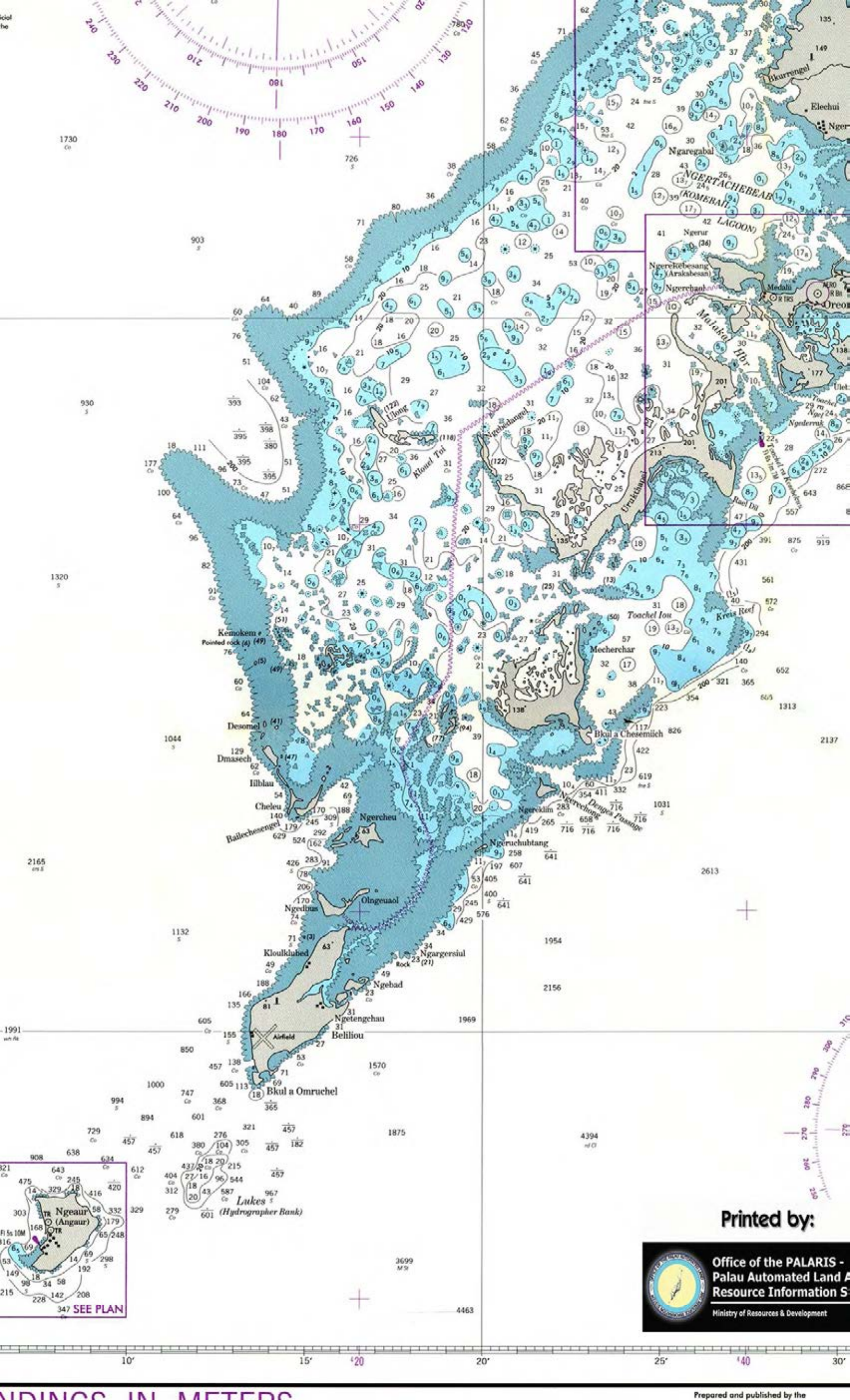


Table 1. Summary of bleaching prevalence in Palau in July-August, 2010.

| Family           | Genus              | Bay reef | Bay reef  | Outer reef | Outer reef | Patch reef | Patch reef |
|------------------|--------------------|----------|-----------|------------|------------|------------|------------|
|                  |                    | mean     | Std. dev. | mean       | Std. dev.  | mean       | Std. dev.  |
| Acroporidae      | <i>Acropora</i>    | 12.05    | 13.81     | 59.78      | 50.41      | 33.94      | 30.31      |
|                  | <i>Astreopora</i>  | 1.80     | 0.84      | 1.83       | 1.01       | 6.02       | 7.53       |
|                  | <i>Montipora</i>   | 5.86     | 8.26      | 34.82      | 16.56      | 14.94      | 14.36      |
| Agariciidae      | <i>Pachyseris</i>  | 1.25     | 0.42      | 1.21       | 0.39       | 2.75       | 2.06       |
|                  | <i>Pavona</i>      | 6.71     | 5.69      | 8.17       | 11.47      | 8.69       | 13.41      |
| Faviidae         | <i>Caulastrea</i>  |          |           |            |            | 1.00       | 0.00       |
|                  | <i>Cyphastrea</i>  | 2.00     | 1.00      | 2.29       | 1.97       | 2.85       | 1.86       |
|                  | <i>Diplostrea</i>  | 1.00     | 0.00      | 1.40       | 0.66       | 1.00       | 0.00       |
|                  | <i>Echinopora</i>  | 8.17     | 11.11     | 1.96       | 1.08       | 3.58       | 3.40       |
|                  | <i>Favia</i>       | 4.74     | 5.10      | 5.91       | 5.31       | 5.01       | 6.10       |
|                  | <i>Favites</i>     | 9.52     | 12.38     | 10.52      | 8.67       | 7.47       | 10.36      |
|                  | <i>Goniastrea</i>  | 15.31    | 24.99     | 7.45       | 5.47       | 5.09       | 5.92       |
|                  | <i>Leptastrea</i>  |          |           | 1.00       | 0.00       |            |            |
|                  | <i>Leptoria</i>    | 1.50     | 0.71      | 2.93       | 2.54       | 1.68       | 0.77       |
|                  | <i>Montastrea</i>  | 4.00     | 2.83      | 1.00       | 0.00       | 1.00       | 0.00       |
|                  | <i>Oulophyllia</i> | 1.00     | 0.00      |            |            | 1.00       | 0.00       |
| <i>Platygyra</i> | 5.44               | 4.07     | 1.44      | 0.72       | 1.63       | 0.87       |            |
| Fungiidae        | <i>Ctenactis</i>   | 3.93     | 2.42      | 1.00       | 0.00       | 2.59       | 1.56       |
|                  | <i>Fungia</i>      | 8.42     | 9.44      | 1.61       | 0.70       | 5.63       | 5.85       |
|                  | <i>Heliofungia</i> | 19.89    | 14.16     |            |            |            |            |

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|                  |                        |       |       |       |       |       |       |
|------------------|------------------------|-------|-------|-------|-------|-------|-------|
|                  | <i>Herpolitha</i>      | 1.00  | 0.00  |       |       | 1.00  | 0.00  |
|                  | <i>Podabacia</i>       |       |       |       |       | 1.00  | 0.00  |
|                  | <i>Sandalolitha</i>    | 2.00  | 0.00  |       |       | 1.50  | 0.71  |
| Merulinidae      | <i>Hydnophora</i>      | 2.50  | 2.12  | 3.14  | 2.38  | 3.91  | 4.83  |
|                  | <i>Merulina</i>        | 1.75  | 1.17  | 1.29  | 0.49  | 1.31  | 0.59  |
| Mussidae         | <i>Acanthastrea</i>    | 7.00  |       | 2.20  | 0.84  | 1.00  | 0.00  |
|                  | <i>Lobophyllia</i>     | 7.00  | 12.81 | 1.10  | 0.22  | 1.06  | 0.17  |
|                  | <i>Symphyllia</i>      | 5.80  | 5.67  | 1.22  | 0.54  | 1.19  | 0.37  |
| Non-Scleractinia | <i>Heliopora</i>       |       |       | 4.48  | 3.47  | 2.56  | 1.90  |
|                  | <i>Millepora</i>       |       |       | 2.26  | 2.00  | 1.63  | 0.96  |
| Oculinidae       | <i>Galaxea</i>         | 2.00  | 1.00  | 10.07 | 10.74 | 2.14  | 1.63  |
| Pectiniidae      | <i>Echinophyllia</i>   |       |       | 1.00  | 0.00  | 1.00  | 0.00  |
|                  | <i>Mycedium</i>        | 1.00  | 0.00  | 1.00  | 0.00  | 1.00  | 0.00  |
|                  | <i>Oxypora</i>         |       |       | 1.00  | 0.00  | 1.00  | 0.00  |
|                  | <i>Pectinia</i>        | 1.50  | 0.50  |       |       | 1.00  | 0.00  |
| Pocilloporidae   | <i>Pocillopora</i>     | 3.68  | 5.57  | 18.91 | 11.73 | 8.67  | 8.65  |
|                  | <i>Seriatopora</i>     | 3.60  | 5.34  | 7.27  | 8.20  | 40.40 | 47.67 |
|                  | <i>Stylophora</i>      | 1.00  |       | 3.96  | 4.55  | 2.08  | 1.51  |
| Poritidae        | <i>Goniopora</i>       | 10.50 | 10.94 | 15.00 | 0.00  |       |       |
|                  | <i>Porites</i>         | 37.74 | 20.56 | 9.56  | 13.00 | 23.33 | 30.83 |
|                  | <i>Porites massive</i> | 15.93 | 14.16 | 12.92 | 16.24 | 10.00 | 9.88  |
| Siderastreidae   | <i>Coscinaraea</i>     | 3.00  | 0.00  |       |       | 1.00  | 0.00  |
|                  | <i>Psammocora</i>      | 1.42  | 0.49  | 1.91  | 1.22  | 2.02  | 1.45  |



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Ministry of Resources & Development

2010 Report:

# Feasibility of Whale and Dolphin Watching Tourism in Palau



THE  
**PEW**  
CHARITABLE TRUSTS





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## **Introduction**

Pacific Island people's culture and lifestyle has always been intimately linked with the marine environment and its resources. Increasingly, Pacific Island countries are looking at new, more sustainable ways to generate a livelihood, including a strong focus on the development of nature tourism, recently in the form of whale and dolphin watching.

Whale watching is one of the fastest growing nature tourism industries in the world. In 2008, 13 million people participated in whale watching in 119 countries and territories, generating total expenditure of \$2.1 billion dollars. (IFAW 2009)

However whilst there is general acceptance of the importance of marine species to the lives of Pacific Island peoples, there is also a growing awareness of the increasingly threatened status of many if not all of these iconic species and the need for concerted and coordinated approach among Pacific Island Countries and Territories and their partners to arrest, reverse and recover declining population trends.

## **Regional context**

Palau is one of 22 Pacific Island members of SPREP – the Secretariat for the Regional Environment Program. As such Palau is a signatory to SPREP's Whale and Dolphin Action Plan (WDAP) which is a comprehensive framework for the conservation and management of whales and dolphins across the region. The WDAP highlights the need for marine mammal research and the development of sanctuaries in the region, and provides a basis for the sustainable development of whale & dolphin watching tourism.

One of the fastest regions for growth in whale watching is the Pacific Islands. In 2005, tourists and Pacific Islanders made more than 110,700 visits to watch whales and dolphins – a tenfold increase on the previous figure of 10,300 in 1998. (IFAW 2008) Whale watching tourism is now valued at over USD 21 million for the region, up from almost USD 1.2 million in 1998 (IFAW 2008) Clearly, the industry now plays an important role in Pacific tourism and provides many social and economic benefits to Pacific Island People.

An historic CMS (Convention on Migratory Species) MoU for the Conservation of Marine Mammals and Their Habitats in the Pacific Islands Region was developed in 2006 and is now signed by 13 countries and territories. The SPREP WDAP is the annexed action plan to this agreement. As Palau is a CMS member, this MoU has the potential to underpin future development of management measures for whales and dolphins in Palau.

## **Objectives of the Study**

In July 2010, a field visit to Palau was conducted by the consultant, Olive Andrews, Program Director of Whales Alive, in collaboration with Tiare Holm, Director of Sustainable Decisions, the aim of which was to assess what potential there is for Palau to develop a whale and dolphin watching industry.

Objectives of the study were to:

- determine whether there are dolphin species in the lagoon and near shore areas, if so where, what species, and how frequently sighted
- determine whether there are large whale species in the near shore and off shore areas, if so where, what species and what time of year they are present
- identify all government agencies and individuals involved in the potential management of marine mammal tourism and meet with them
- identify the key licensed marine tourism operators with the potential interest in the development of marine mammal tourism and meet with them
- identify current management and legislative frameworks affording levels of protection for marine mammals
- assess existing marine mammal tourism operations
- assess tourism infrastructure
- inform local stakeholders about whale conservation, research and tourism in the Pacific Islands Region on behalf of project partners

## **Scope**

The study area is The Republic of Palau which is located in the North Pacific Ocean with more than 300 islands and a total land area of 196 square miles. Spread over 325 miles of the Pacific Ocean and the Philippine Sea, the nearest landmass is Papua New Guinea (660 kilometres to the south), the Philippines (880 kilometres to the west) and Guam (1,300 kilometres to the northeast).

The scope of this feasibility study spans the inshore reef areas of Koror state that are the focus of existing tourism operations including the near shore areas to seaward of the barrier reef accessed daily by diving operations.

## **Approach and Methodology**

Limited time and funds precluded a dedicated research project, thus the consultant focused on 2 methods of information gathering:

- a. interviewing as many stakeholders as possible to collect anecdotal information about the seasonal occurrence, species, and abundance of cetaceans
- b. carrying out opportunistic sightings surveys conducted on board local tourism operation platforms including boats and helicopters aiming to cover as much water as possible in a randomized fashion

Cetacean sightings data was collected when animals were encountered on 2 out of 7 days from the boats and on one helicopter flight. Images were taken using a canon Eos 50D camera with 300mm lens. Position data was taken by plotting waypoints on a hand held GPS.

In addition to visual data collected by the consultant during the consultation period, a sightings data sheet was distributed as basis for discussion and anecdotes to 30 stakeholders representing 6 of the main marine tourism operations, charter and sports fishermen, pilots, government officers, parliamentarians and NGO's.

In addition to meetings and interviews the consultant was interviewed on local news television to raise awareness about the study and raise the profile of marine mammal conservation efforts in the region and encourage sightings information to be reported. Furthermore, stakeholders were invited to attend a public presentation which was conducted for a local audience of about 50 people.

### **Analysis of Tourism in Palau**

Palau's natural beauty and diverse marine life makes it one of the most popular scuba diving destinations in the world attracting scores of US, Taiwanese and Japanese divers annually and could prove to be an ideal location for whale and dolphin watching.

Tourism (and its attendant infrastructure) is Palau's main industry. The number of visitors--37% from Japan, 23% from Taiwan, 18% from Korea, and 12% from the U.S.--was 71,887 in 2009, a 9% decrease from 2008 (US DOS, 2010).

Continental Airlines has direct flights to Palau from Guam and the Philippines. Japan Airlines runs chartered flights from Tokyo, and Korean Airlines does the same from Seoul on a seasonal basis. At the time of writing, Pacificflir has ceased operations, however opened up a new potential tourism market from the East Coast of Australia.

In 2007 tourist spending in Palau was estimated at \$111.9 million. Palauan tourism and environmental authorities would like to adjust the industry, simultaneously decreasing tourist volume and increasing income by attracting more high-dollar tourists.

The service sector dominates the Palauan economy, contributing more than 50% of GDP and employing more than half of the work force. The government alone employs nearly 31% of workers and accounts for 20% of the GDP. The tourism sector is one of the most lucrative foreign investments in Palau and is its main source of income. According to the Pacific Islands Trade and Investment Commission it has a well advance tourism infrastructure with room for further expansion.

## **Existing marine mammal tourism**

Though there are over 40 licensed marine tourism operators offering dive, snorkel and kayaking opportunities, a brief analysis of their promotional material reveals that none of the existing operators advertise or promote seeing wild cetaceans even though sightings are frequent from the dive boats and helicopter tours. Few include a picture of a dugong in their brochures yet dugongs are seldom seen on marine tours.

The main existing marine mammal tourism operation, Dolphins Pacific, boasts the world's largest dolphin research facility. The centre is host to 7 captive bottlenose dolphins, originating from Taji, Japan, from an original number of 12 imported in the late 1990's. With a mixture of Japanese and local trainer/guides, the operation facilitates around a dozen programs with differing levels of interaction with the dolphins, from pool-side petting to free swimming.

These types of aquaria encounters are popular with Asian tour groups because the animals and facility is accessible year round, they can supply supervised encounters with the animals and produce a sought after 'take home' product of a photograph of tourists with the animals.

This concept of captive animals however is not entirely congruent with Palau's 'nature tourism' reputation and as the majority of tourists that come to Palau can be categorized as 'eco-tourists', eager to experience the country's wild nature through diving etc, it is the consultant's opinion that there is room to develop a marine mammal watching industry based on encounters with wild cetaceans without impacting on the success of the existing captive operation.

## **Status of Marine Mammals in Palau**

Anecdotal reports dominate the cetacean listing available for Palau (WDCS 2007). Such reports include a pod of orca photographed in April 1993 (Rock 1993 in Reeves et al. 1999) and it was inferred from local reports that their presence was not unusual. . Other reports also affirm the presence of orca in Palau (Iwashita 1963, Reeves et al. 1999) as did relatively recent community consultations that identified both orca and sperm whale in the region (PCS 2003).

Melon-headed whales have been documented to strand on the Palau coast (Donaldson 1983). Anecdotal reports have also placed short-finned pilot whales (in Reeves et al. 1999) and striped dolphins (Miyazaki and Wada 1978) in Palau waters.

Dated records for false killer whale and pantropical spotted dolphin have been reported (Eldredge 1991). Reports of Risso's, Fraser's, and spinner dolphin, as

well as Cuvier's beaked whale that appear to be within (or very close to) the Palau EEZ were summarized by Eldredge (1991). Finally, careful review of whaling records showed that takes of Bryde's whales (species not confirmed) occurred within the Palau EEZ in the 1980s (Perrin 2006).

### **Legislative context**

There are comprehensive and strict protection measures for dugongs in Palau, which are the most isolated population in the world numbering an estimated 50 – 200, however until 2010 there has been no national legislation that refers directly to cetaceans.

Title 24 Environmental Protection of the Palau National Code, 1986 Edition, refers to protected sea life under Division 2: Wildlife Protection, 1231 Conservation of dugongs.

(a) No person shall kill, trap, capture, wound, restrain or otherwise have under his control any dugong thereof, except as provided for in subsections (b) and (c).

The Bureau of Marine Resources (BMR) works towards the conservation of Palau's marine resources by recommending the passage of laws and regulations such as The Domestic Fishing Laws 2002, which reinforces no take of dugongs and provides natural history and biology information for the species but does not include cetaceans. This out dates the Marine Protection Act 1994 which set restrictions on a number of protected species of fish and crustaceans, but precludes any protection measures for cetaceans.

### **Palau Whale Sanctuary: Conservation and Management**

At the time of writing, the Minister of Environment, Natural Resources and Tourism, Hon. Harry Fritz, declared a new national Marine Mammal Sanctuary in Palau's EEZ with the support of Palau's Queen, President and National Congress.

Though there is a lot of work to do to develop the Sanctuary legislation and corresponding management measures, the timing is ideal and will provide the appropriate mechanisms for the development of whale & dolphin tourism whilst maintain focus on the protection of marine mammals. There is also strong links and lessons learned from Palau's National Shark Sanctuary, which has precipitated sharp increases in tourism and global attention on Palau's conservation decisions concerning pelagic and migratory species.

Civil society and NGOs are highly regarded by Government partners and are active in the conservation and management of marine resources. As such there is a working partnership between NGOs, government and civil society that will be of huge benefit to the growth of marine mammal tourism.

## Opportunistic sightings survey 2010

A total of 30hrs was spent on water by the consultant over 5 intermittent days between 7 – 17<sup>th</sup> July, 2010 on board platforms of opportunity provided generously by local tourism operators. The focus of the tours was diving and snorkeling and as such the distribution of sightings effort is limited to the transit between Koror and popular dive sites along the South and West barrier reef and Peliliu Island, with sighting effort both underway and also when the boat was stopped or moored to facilitate divers.

During this time the consultant sighted a pod of 70 spinner dolphins, *Stenella longirostris* in Ulong Bay on 9 July, 2010. Although the tourism operators reported several sightings of spinner dolphins and a large pod of melon headed whales, *Peponocephala electra*, during the survey on days that the consultant was not on the water.

The consultant was also able to make 1 aerial survey from a helicopter on 11 July, 2010 and sighted a pod of 30 spinner dolphins, 3 dugong (including a calf), and 2 bottlenose dolphins off the Sth West barrier reef. Figure 1 shows the vessel tracks and helicopter track in blue with the sightings of marine mammals as waypoint marker flags in blue.

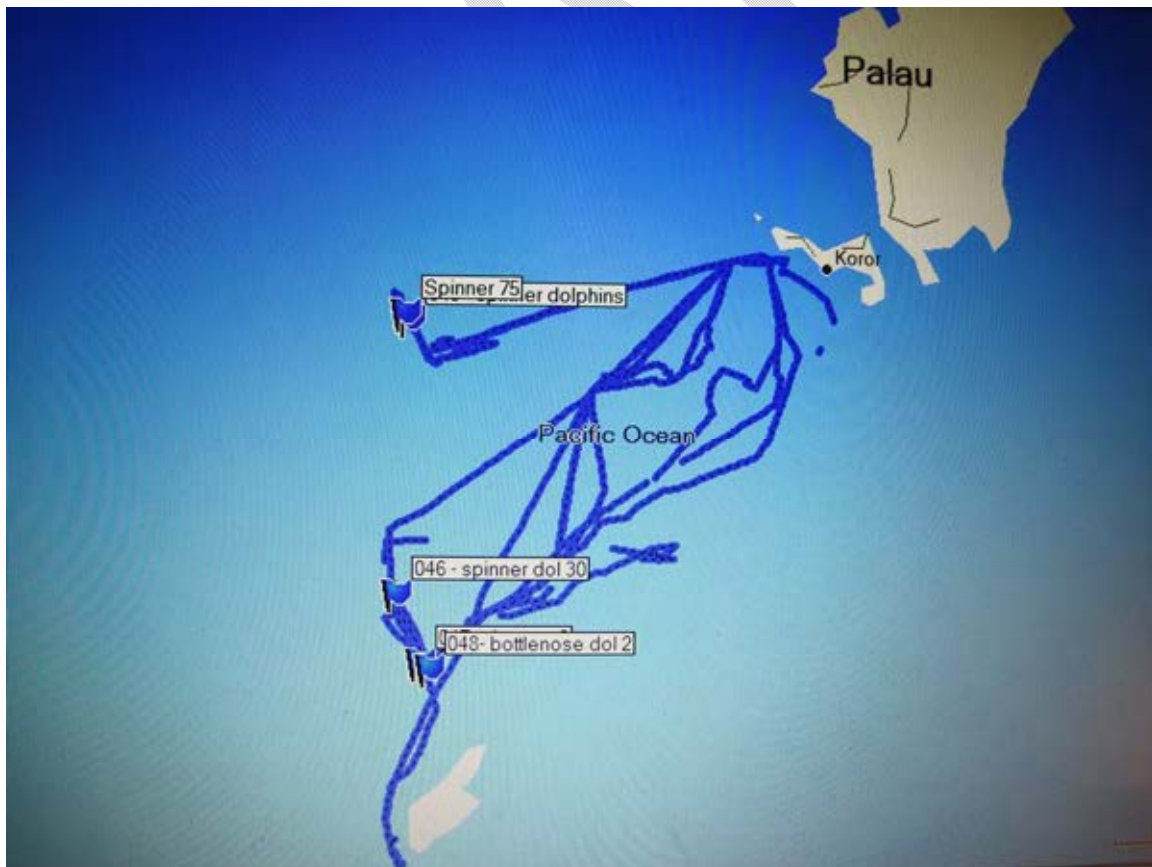


Figure 1: Survey tracks by boat and helicopter with sightings

### **Anecdotal sightings survey 2010**

Figure 2 below summarises the anecdotal sightings of small cetaceans with notable hotspots around Ulong and Peleliu. The number of sightings in these areas may be attributed to the amount of tourism effort or coverage and it is likely that the animals transit a much larger portion of the western barrier reef that is not as well covered by existing operations. Most small cetacean species were sighted all year round (a summary of anecdotes and information on cetacean behavior reported from interviews is annexed to this report).

Most interviewees who described pilot whales changed their species description when shown the marine mammal guide and it appears that there the species commonly thought to be pilot whales are in fact melon headed whales. These animals do not migrate and if they are present in Palau, it is likely that they will be there year round, and as such may be an important tourism resource.



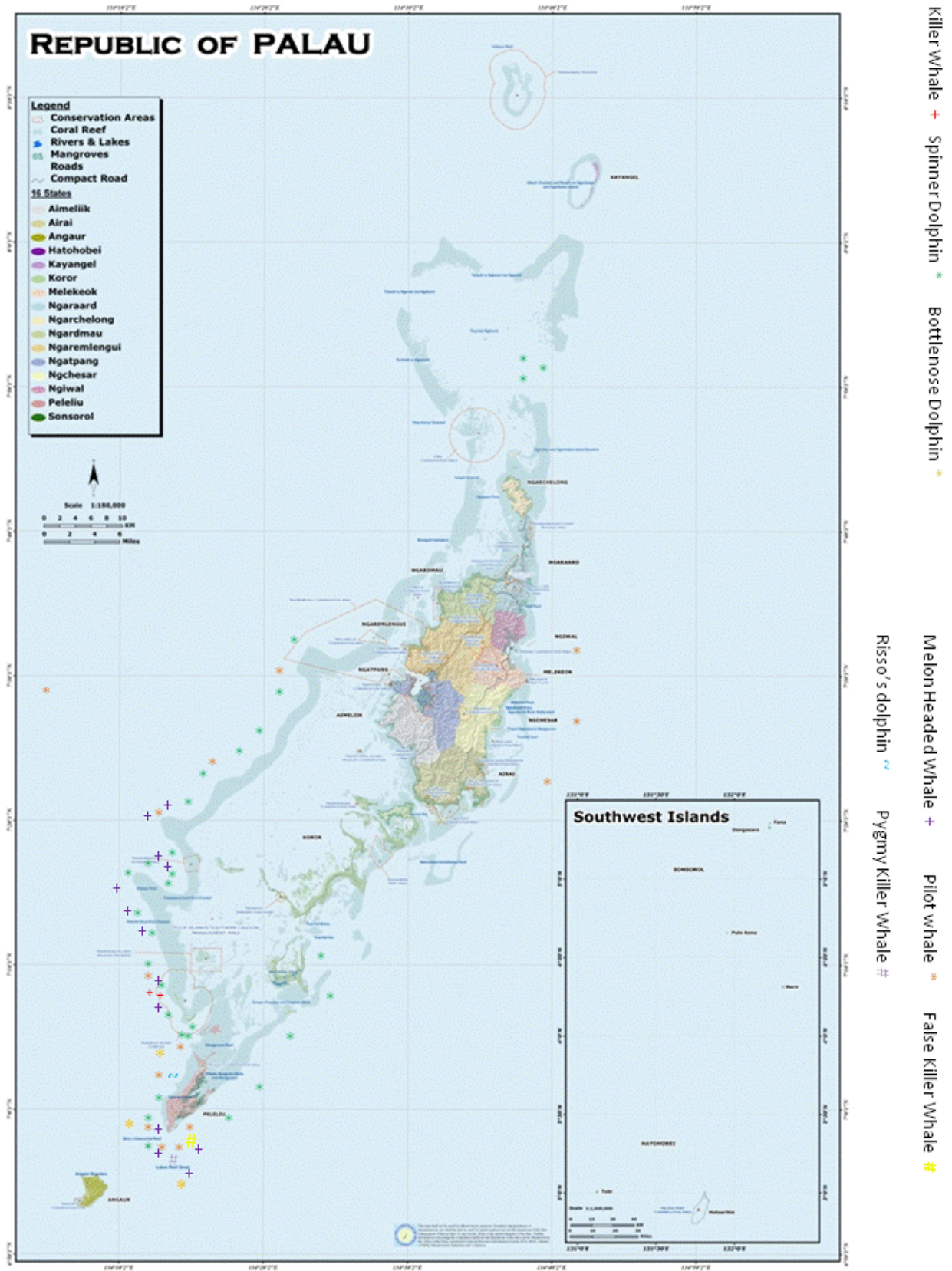


Figure 2: Anecdotal sightings of small cetaceans

Figure 3 summarises the anecdotal sightings of large whales, most of which are described as sperm whales. Most interviewees described sightings of single sperm whales as well as larger aggregations of sperm whales (pods up to 20 individuals) in a broad area to Palau's South East and also described feeding activity such as squid parts on the surface and defecation. Some unidentified baleen whales were described and also a single sighting of a humpback at Peleliu. Most large whale sightings appear to occur in the winter season Nov – March annually.

DRAFT

Sperm Whale + Baleen Whales # Humpbackwhale \*  
Cuvier's beaked whale @

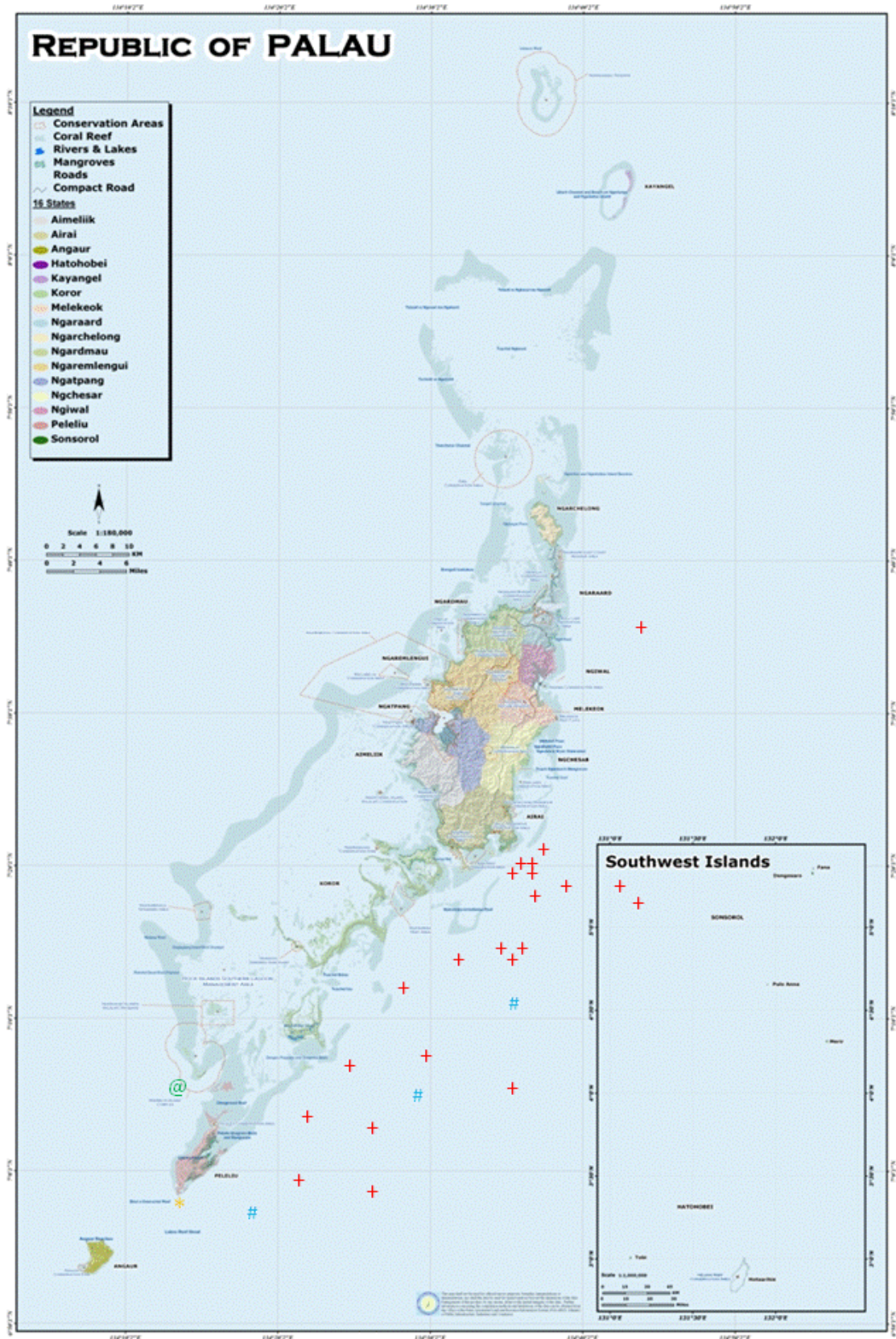


Figure 3: Anecdotal sightings of large whales

## **Opportunities**

There is significant evidence of the presence of cetaceans in Palau waters from the feasibility study to suggest that the potential to develop Palau's whale and dolphin watching nature tourism industry is indeed feasible.

The anecdotal presence of 15 species of cetaceans within a short distance from the barrier reef, and potentially up to 30 species of cetaceans, coupled with the existing marine tourism infrastructure indicates that with operator training, regulation and monitoring, and appropriate marketing, a whale and dolphin watching industry could be developed sustainably with little capital investment.

As is exemplified in other Pacific island neighboring countries, it appears feasible for the existing marine tourism and charter fishing operations to conduct small scale, seasonal, opportunistic whale and dolphin watching until we have a better understanding of the cetacean populations.

## **Research Needs**

The first priority for the new Palau Marine Mammal Sanctuary is also a necessity as a basis on which a sustainable whale and dolphin watching industry must grow: scientific research.

SPREP's Whale and Dolphin Action Plan partnered and supported by SPWRC and Whales Alive, recommends that baseline cetacean surveys be initiated in the region to develop species inventories and identify species and habitat of conservation concern. It also advocates expansion of existing research programs to include areas not previously covered such as Palau and encourages the inclusion of local capacity where possible.

The partners of this report are available to assist Palau in further identifying the species and status of whales and dolphins in their waters. There are a number of options available in terms of methodology and budget however a systematic off-shore, line transect survey would provide a rapid type of assessment of the species present in Palau, which should be followed up with dedicated near shore work focused on a few target species relevant for tourism.

Further to that there are opportunities to conduct opportunistic marine mammal research through collection of sightings data by the tourism operators. In some countries it is a license requirement to fill out species data sheets that inform government and aid the management of the species.

## **Regulation**

Whale watching has become one of the fastest growing nature tourism industries in the world. Correspondingly, strategies for the management of this industry are

critical as human activities focused on interactions with whales and dolphins have been correlated to long-term displacement of the animals from preferred habitat and reduced reproductive success of some populations.

SPREP and the International Fund for Animal Welfare (IFAW) in 2008 developed Pacific Islands Regional Guidelines for Whale & Dolphin Watching which provides a template for governments to assist the management of whale and dolphin tourism activities. These guidelines aim to ensure the conservation of the animals while providing benefits to small island nations. These regional guidelines were developed at a regional workshop in Auckland by 35 people from 13 Pacific island countries and are the product of the experience of both government and industry spokes people and global best practice standards.

The regional guidelines are the best example available to Palau as a basis from which to develop national regulations for interactions with whales and dolphins.

### **Training Needs**

As education has become an environmental management tool, it is evident that one appropriate method to manage the development of whale watching for the minimization of adverse effects on the animals is to develop training programs for whale watching operators and guides, and standards for the quality of the education being presented by them in order to increase awareness and encourage compliance to industry best practices and national regulations.

Though the marine tourism industry in Palau is mature and the operators and guides amongst the highest standard in the world, specific, additional training is necessary for the operation of vessels and the management of guest expectations around marine mammals.

Whales Alive has developed a Whale Watching Operator and Guide Training Program which has been conducted in 8 Pacific Islands. The program is a management tool to meet the identified skill requirements of guides for the delivery of a successful whale watch operation, so as to ultimately minimise potential impacts of tourism on whales and maximise the educational value of the experience to tourists. This program can be adapted to suit Palau's training needs.

### **Recommendations**

1. Develop a Plan of Management for Palau Marine Mammal Sanctuary to include a section on marine mammal tourism and its sustainable development over the next 5 years
2. Review and adopt as regulation the SPREP endorsed Regional Guidelines for Whale & Dolphin Watching after stakeholder consultation and adaption to local conditions

3. Palau's new Marine Mammal Sanctuary legislation to include (above) whale and dolphin watching regulations that apply to both commercial and private interactions with marine mammals for both sea going vessels and aircraft.
4. Hold a national marine mammal workshop with project partners and stakeholders from outer islands, government, NGO's and industry to review and agree whale & dolphin watching regulation (as above), and deliver the Whales Alive training program for whale watching operators, guides and managers. This could take the form of 1 day for regulations, 1 day for operator training and 1 day for managers and enforcement officer training.
5. Coordinate with and build on existing networks for enforcement and monitoring of tourism activities in the Sanctuary
6. Conduct an initial visual and acoustic, systematic, line-transect survey of marine mammals in Palau waters covering an area at least 15 nautical miles to seaward of the barrier reef to scientifically identify a cetacean species list for Palau and inform the development of the Sanctuary Management Plan and tourism development
7. Based on species distribution information attained from the line transect survey, conduct long term photo identification and monitoring programs of species and populations targeted for tourism interactions as well as research on the impacts of tourism activities
8. Deliver community education programs for schools and general public about the values of the Sanctuary and known species biology and conservation
9. Develop a licensing framework for marine mammal tourism operators to include specific educational, safety, and research requirements i.e. Tourism operators should be required to fill in sightings forms to contribute to the long term research and management of the target species. And include a license fee which contributes to the long term monitoring and management of the industry and supports research and conservation of the animals

## **Conclusion**

Whale watching has the potential to focus international attention on the unique, marine heritage resources of Palau, providing social benefits by creating jobs, boosting education and training, and stimulating the regions economy through the development of competitive, cultural and environmental, nature tourism products.

As the socioeconomic value of whale watching grows in the South Pacific, so too does the promise of the long-term conservation, preservation and management of whales and their fragile habitat.

To ensure the long term viability of this industry in Palau: Specialised training, public education and research have to continue to be the basis on which the industry grows. This can be achieved through successful partnerships between the Government of Palau, PEW Environment Group, Whales Alive and SPREP.

## References

Lots to ADD

US Department of Sate 2010, <http://www.state.gov/r/pa/ei/bgn/1840.htm>

DRAFT

**RPPL 4-35**  
**FOURTH OLBIL ERA KELULAU**

Seventh Regular Session, July 1994

**AN ACT**

To amend RPPL No. 4-18, regarding the taking of certain species of marine and terrestrial organisms, to clarify and strengthen the penalties and enforcement provisions, to require the Minister to promulgate regulations concerning cultured species, and for other purposes.

**THE PEOPLE OF PALAU REPRESENTED IN THE OLBIL ERA KELULAU DO ENACT AS FOLLOWS:**

(a) Section 3 of RPPL No. 4- 18 is hereby amended to add the following:

"( ) 'Export' means (a) an actual or attempted shipment, transport, or transfer of fish out of the Republic of Palau; or (b) a transfer of fish to any person within the Republic of Palau with the knowledge or intent that the fish will be shipped, transported or transferred out of the Republic of Palau-

(b) Section 4 subsection 6 of RPPL No. 4-18 is hereby amended as follows:

“ . . . .

(6) Except as authorized by regulation or permit issued by the Minister, fish while using any form of underwater breathing apparatus other than a snorkel.

. . . .”

(c) Section 4 of RPPL No. 4-18 is hereby amended to add the following provision after subsection (15):

"(16) make any entry or statement in any writing completed or submitted in connection with the export of fish which is false or misleading."

(d) Section 9 of RPPL No.4-18 is hereby amended as follows:

**Section 9. Penalties.**

(a) **Criminal Penalties:**

(1) Anyone who violates subsections 1-5, 7-10, or 12-15 of Section 4 herein shall, upon conviction, be penalized as follows: upon the first conviction, be fined not less than two hundred fifty dollars (\$250.00); upon the second conviction, be fined not less than five hundred dollars (\$500.00) and sentenced to serve up to thirty (30) days in jail; upon the third conviction, be fined not less than one thousand dollars (\$1,000.00) and sentenced to serve up to six (6) months in jail; any conviction after a third conviction, be fined not less than five thousand dollars (\$5,000.00) and sentenced to serve up to one year in jail.

(2) Anyone who violates subsection 6 of Section 4 shall, upon conviction, be fined not less than five hundred (\$500.00) dollars or imprisoned for not more than one (1) year, or both.



(3) Anyone who violates subsection 11 of Section 4 shall, upon conviction, be fined not less than three hundred dollars (\$300.00) or imprisoned for a period of not more than two (2) years, or both, for each violation.

(4) Anyone who violates subsection 16 of Section 4 shall, upon conviction, be fined not less than four hundred dollars (\$400.00) or imprisoned for a period of not less than six (6) months and not more than two (2) years, or both, for each violation.

(b) Civil Penalties:

(1) Civil penalties are separate from criminal punishment and may be filed independent of or in addition to such criminal charges and sentences.

(2) Any person who is found by the Supreme Court in a civil proceeding to have committed an act prohibited by this Act, his employer, principal, superior, or supervisor if the violation was committed as part of a commercial operation or enterprise, and any person who aids or abets in such violation, shall be liable to the affected state and national government for a civil penalty which shall not exceed two hundred thousand dollars (\$200,000) for each violation.

(3) In determining the amount of such penalty, the Supreme Court shall take into account the nature, circumstances, extent, and gravity of the prohibited acts committed and, with respect to the violators, the degree of culpability, any history of prior offenses, and such other matters as justice may require.

( The Attorney General is authorized to initiate all civil proceedings under this section and to recover the amount assessed as a civil penalty."

(e) Section 4, subsections 1, 2, 3,4, 5, 7, 8, 9 and 10 of RPPL No.4-18, are hereby amended to read as follows:

"(1) fish for, sell, or buy any of . . . .

(2) fish for, sell, or buy any of the following species: . . . .

(3) export, or fish for, sell, or buy for export the following species:

(a) Adult parrot fish . . . .

(5) fish for, sell, or buy rabbitfish . . . .

(6) fish for, sell, or buy the following species.

(7) export black teatfish (*Holothuria nobilis* (bakelungal)), white teatfish . . . .

(8) commencing one year after the effective date of this Act, export sea cucumbers (*Actinopyga miliaris* (cheremrum) except cultured species thereof; . . . .

(9) take, buy or sell any coconut crab (*Birgus latrol*) smaller . . . .

(10) take, buy or sell any mangrove crab (*Scylla serrata*) smaller than . . . . "

(f) Section 4, subsection 11, of RPPL No. 4-18 is hereby amended to read as follows:

"(11) export clam (*Tridacna gigas* (Otkang)); *T. squamosa* (Ribkungel) ; *T. derasa* (Kism); *T. maxima* (Melibes); *T. crocea* (Oruer); *Hippopus porcellanus* (Duadeb); and *Hippopus hippopus* (Duadeb), or part thereof, except cultured species; . . . .  
"

(g) Section 7 of RPPL No. 4-18 is hereby amended to read as follows:

"Section 7. Labeling and Cultured Species Regulations.

(a) Within six (6) months of the enactment of this Act, the Minister shall promulgate regulations instituting a labeling and reporting system by which all exporters of fish report the weight of fish by species exported.

(b) Within six (6) months of the enactment of this Act, the Minister shall promulgate regulations setting out procedures to certify species as cultured."

(h) The following scientific names in Section 4, subsections 1, 3, 7, 9, and 11, of RPPL No. 4-18 are hereby amended to read as follows:

(11) "*P. leavis*" should read "*P. laevis*".

(3) "*Cheilunus undulatus*" should read "*Cheilinus undulatus*".

(7) "*Cheilunus undulatus*" should read "*Cheilinus undulatus*".

(9) "*Birgus latrol*" should read "*Birgus latro*".

(12) "*Tridacnae gigas*" should read "*Tridacna gigas*".

**Section 2. Effective date.** This Act shall take effect upon its approval by the President, or upon its becoming law without such approval, except as otherwise provided by law.

PASSED: May 3, 1995

Approved this 17th day of May, 1995.

\_\_\_\_\_  
/s/

Kuniwo Nakamura  
President, Republic of Palau

**RPPL 6-39**  
**SIXTH OLBIL ERA KELULAU**

**Tenth Special Session, May 2002**

**AN ACT**

To create the Protected Areas Network Act; to repeal Chapter 32 of 24 PNC; and for other related purposes.

**Section 1.** Legislative findings. The islands that make up Palau together form one of the most environmentally diverse regions in Micronesia. Our islands possess unique geological features and distinctive freshwater, marine, and terrestrial ecosystems, including plants, animals and other organisms, many of which occur nowhere else in the world. All of these natural resources are highly vulnerable to loss or destruction by the growth of population and development. The Olbil Era Kelulau finds that Palau is in critical need of a nationwide system to support the states' efforts in protecting these natural resources. The crucial first step is to identify representative high biodiversity areas and unique marine and terrestrial sites for priority treatment as parts of a nationally recognized network of protected areas. This legislation, the Protected Areas Network Act, will encourage and support the states in the designation of new protected areas. Until now, states have designated protected areas, but there has been no system by which the national government recognized these areas or assisted the states in identifying, designating and maintaining these valuable resources. A nationwide approach is necessary to ensure that examples of the full range of biodiversity are preserved in protected areas across Palau and that the unique natural beauty and precious resources for which Palau is internationally recognized will not be lost or destroyed. The Protected Areas Network Act will better enable the national government to assist the states in several ways. This will include technical assistance to those states that seek to designate areas of significant biodiversity and unique habitats for protection by facilitating access to grant monies and programs for which the individual states are not ordinarily eligible. Thus, the national government will act as a conduit for funding that is destined to aid the states. The national system will also facilitate cooperation among the states where areas of high biodiversity and unique habitats cross state boundaries. The current vehicle for state designation of natural resource areas, the Natural Heritage Reserve System, 24 PNC Chapter 32, does not include significant incentive or support systems for states to participate in the program and has not been used by states to protect the ecosystems within their boundaries.

Accordingly, 24 PNC Chapter 32 should be repealed based on our belief that the new Protected Areas

Network Act will be more effective in meeting our national environmental protection goals and providing national recognition and support for protected areas.

**Section 2.** Repealer. 24 PNC Chapter 32 is hereby repealed.

**Section 3.** Amendments. 24 PNC is amended to add a new Chapter 33 to read as follows [sic]:

“Chapter 33

Protected Areas Network Act

Section 3301. Short title. This chapter shall be known and may be cited as the “Protected Areas Network Act” of the Republic of Palau.

Section 3302. Findings and declaration of necessity. The Olbiil Era Kelulau finds and declares that:

- (a) the Republic of Palau possesses unique natural resources such as geological features and distinctive plants, animals, and other organisms, many of which occur nowhere else in the world, that are highly vulnerable to loss by the growth of population and development;
- (b) Palau’s unique plants and animals exist in the context of a full range of ecosystems and communities found in Palau, and thus, these ecosystems themselves must be protected as well;
- (c) as the exclusive owners of all living and non-living resources from land to twelve (12) nautical miles seaward from the traditional baseline, state governments bear the principal responsibility for the management, protection, and development of all resources within their respective boundaries. States, therefore, must be encouraged and supported by the national government in their efforts to protect biodiversity in the Republic through the creation of protected areas;
- (d) state designated terrestrial, freshwater, and marine areas that support unique communities of natural plants, animals, and other types of organisms, areas of high biodiversity, significant geological sites, as well as other important habitats suitable for preservation must be encouraged, recognized, and supported by the national government; and
- (e) a nationwide Protected Areas Network will allow the national government to assist states in the protection of significant areas of biodiversity, significant habitats, and other valuable resources that are important to the future stability and health of Palau.

Section 3303. Definitions.

- (a) “Ecosystem” means a dynamic complex of plant, animal, and micro-organism communities and their non-living environment interacting as a functional unit.
- (b) “Person” means any and all persons, natural or artificial, foreign or domestic, including any individual, association, firm, partnership, business, corporation, joint venture, principal, agent, partnership, company, or any other entity recognizable at law or equity, including (without limitation) any

foreign governmental entity and all political subdivisions, regions, districts, municipalities, and public agencies thereof.

(c) “Protected” means maintained, intact, preserved, conserved, or otherwise managed in a sustainable manner.

(d) “Protected area” means an area designated through a state or national process to be protected, and recognized by the National Government through the Ministry of Resources and Development as part of the Protected Areas Network.

Section 3304. Protected Areas Network. There shall be a nationwide Protected Areas Network of the Republic of Palau which shall consist of areas in the Republic which a state, or states, or the national government has or have designated as reserves, protected areas, or refuges, and which have been designated by the Ministry of Resources and Development in the manner hereinafter provided. Each state, in consultation with the Ministry of Resources and Development, will be responsible for the management of the areas within its borders that are designated as part of the Protected Areas Network. Each state will be eligible for assistance and support under this Act

for those protected areas included within the Protected Areas Network. The Protected Areas Network shall be administered and managed by the Ministry of Resources and Development in consultation with state government officials.

Section 3305. Categories of protected areas. The Ministry of Resources and Development, in consultation with state government officials, shall, for the sole purpose of designation within the Protected Areas Network, designate areas under a set of uniform categories that encompasses a range of management purposes and uses, from sustainable resources use through full protection.

Section 3306. Powers and duties of the National Government. The Republic, primarily through the Ministry of Resources and Development, shall have, among others, the following powers and duties:

- (a) to provide for rules and regulations outlining the process for an area’s designation as part of the Protected Area Network, to effect the purposes of this chapter, and to enforce such regulations, which shall have the force and effect of law;
- (b) to establish criteria for the selection of an area to be included in the Protected Area Network that will incorporate the following considerations: biogeographic importance, ecological considerations, naturalness, economic importance, social importance, scientific importance, international or national significance, feasibility of management and protection, duality or replication;
- (c) to determine reasonable conditions for the ongoing inclusion of an area in the Protected Area Network;

- (d) to investigate and develop mechanisms for sustainable financing of protected areas in the Protected Area Network;
- (e) to accept and disburse appropriations, loans, and grants from the Republic of Palau, foreign governments, the United Nations, or any agency thereof and other sources, public and private, which appropriations, loans, and grants shall not be expended for other than the purposes of this chapter.
- (f) to collect information and establish record keeping, monitoring, and reporting requirements as necessary and appropriate to carry out the purposes of this chapter; and
- (g) to provide technical assistance to state governments for management of their protected areas including, but not limited to, assistance in surveying, developing site preservation plans, identifying and establishing sustainable use practices, conducting scientific investigations, and educating the public about preservation and protected areas.

Section 3307. Powers and duties of the states. Each state shall have the following powers and duties, together with and not in lieu of any other powers and duties granted to the states under existing state and national law:

- (a) to nominate areas within the state's borders that have been designated refuges, protected areas, or preserves under state or national law for inclusion in the Protected Areas Network;
- (b) to nominate, at the request of and with the written consent of a private landowner or title holder, private lands for inclusion in the Protected Areas Network;
- (c) to apply for financial aid and technical support in developing, managing, designating, or nominating for inclusion in the Protected Areas Network eligible areas within the state;
- (d) to develop management plans for such areas, and if an area is designated as part of the Protected Areas Network, to develop such plans in conjunction with the Ministry of Resources and Development;
- (e) to manage areas within the Protected Areas Network; and
- (f) to withdraw from participation in the Protected Areas Network according to the procedures set forth in regulations.

Section 3308. Rules and regulations. The Ministry of Resources and Development shall make regulations pursuant to the Administrative Procedure Act, 6 PNC Chapter 1, governing the recognition of the areas nominated by states as protected areas and the operation of the Protected Areas Network, provided that no rule or regulation which relates to the permitted use of any area shall be applied to a state protected area unless such rule or regulation shall also have been specifically approved by the appropriate state government officials pursuant to and in accordance with all applicable law. Should a state object to

the application of a rule or regulation proposed by the national government in relation to a protected area, the provisions of 24 PNC 3309 will apply.

Section 3309. Dispute resolution.

(a) Any dispute between two or more states or between one or more states and the national government regarding the designation or management of a protected area or related to the funding of a protected area which is not settled by good faith negotiation, shall, at the request of one of them, be submitted to mediation.

(b) Each party shall nominate a person to select a mediator, and the two nominees shall select a third person to serve as the mediator.

Section 3310. Enforcement. Any person who violates state or national laws or any rules, regulations, or procedures promulgated pursuant to this chapter, may be prosecuted by the Attorney General's Office as well as the applicable state authorities. All laws and regulations with relation to a nationally designated protected area, whether established by state or national authorities, may be enforced by the Ministry of Justice, Bureau of Public Safety, state and national law enforcement officers, or such personnel of the Ministry of Resources and Development as the Minister so designate.

Section 3311. Criminal penalties. Any person who is convicted of a violation of this chapter or regulations in relation to a nationally designated protected area may be sentenced to imprisonment for a term of up to 1 year, or fined not less than \$500, or both. Any person convicted of a second violation may be sentenced to imprisonment for a term of up to 2 years, or fined not less than \$2,500, or both.

Subsequent violations shall carry a penalty of up to 5 years imprisonment and a fine of up to \$10,000, or both.

Section 3312. Civil penalties.

(a) Civil penalties are separate from criminal punishment and a civil enforcement action may be filed independently of or in addition to a criminal prosecution.

(b) Any person who is found by the Supreme Court in a civil proceeding to have committed an act prohibited by this chapter, his employer, principal, superior, or supervisor if the violation was committed as part of a commercial operation or enterprise, and any person who aids or abets in such violation, shall be liable to the affected state and national government to pay civil damages for each violation in an amount sufficient to compensate for the harm done to the Protected Area and to deter the prohibited acts in the future. The Supreme Court may also award such declaratory and equitable relief the Court determines is just and proper.

- (c) In determining the amount of the civil penalty, the Supreme Court shall take into account the nature, circumstances, extent, and gravity of the prohibited acts committed and, with respect to the violators, the degree of culpability, any history of prior offenses, and such other matters as justice may require.
- (d) The state in which the violation occurred is authorized to initiate all civil proceedings under this chapter and to recover the amount assessed as a civil penalty.
- (e) If the state declines to bring suit, it shall notify the Attorney General in writing within 90 days of the violation. The Attorney General may initiate all civil proceedings under this chapter at any time more than 90 days after the alleged violation, regardless of whether the state has declined in writing to prosecute the matter.
- (f) Any person who violates this chapter shall be liable in a civil action brought by a person residing within the Republic or the national government or any state government or division thereof. If a judgment is entered against the defendant in an action brought by a resident of the Republic, the plaintiff shall receive 50% of the amount recovered and shall be entitled to recover from the defendant the plaintiff's costs of litigation, plus reasonable attorneys' fees. The remaining 50% of the amount recovered shall be deposited into the National Treasury. Before a resident may bring an action pursuant to this section, the resident must submit a written request to the Attorney General asking that the Attorney General bring a civil action. If the Attorney General fails to bring a civil action within 60 days after receipt of the written request, the resident may thereafter bring a civil action pursuant to this section."

Section 4. Effective date. This Act shall take effect upon its approval by the President, or upon becoming law without such approval, except as otherwise provided by law.

**PASSED: November 07, 2003**

**Approved this 26th day of November, 2003**

/s/

**Tommy E. Remengesau , Jr., President  
Republic of Palau**



**RPPL 7-17**  
**SEVENTH OLBIIIL ERA KELULAU**

Twelfth Special Session, December 2005

**AN ACT**

To ban the practice of bottom trawling in the Territorial waters and exclusive economic zone of the Republic of Palau, and for related purposes.

**THE PEOPLE OF PALAU REPRESENTED IN THE OLBIIIL ERA KELULAU DO ENACT AS FOLLOWS:**

**Section 1. Findings and purpose.** The Olbiil Era Kelulau finds that the 1982 UN Convention on the Law of the Sea lays down the general duty to protect and preserve the marine environment and specifically requires measures to be taken to protect and preserve rare or fragile ecosystems, the habitat of depleted, threatened, or endangered species and other forms of marine life. Nations are required to take into account the interdependence of stocks and effects on associated and dependent species when managing stocks, both in the exclusive economic zone (EEZ), and on the high seas. The obligations also include taking, or cooperating with other Nations in taking, measures necessary for their nationals to conserve the living resources of the high seas.

The Olbiil Era Kelulau finds that in bottom trawl fishing, trawl nets can contact the sea bottom almost continually, and often dig into the sea-floor 10-25 cm, depending on how hard the sea floor is. Bottom trawling has been found to destroy up to 98% of the coral cover of seamounts as well as cause the depletion of the targeted fish stocks. Bottom trawling removes large numbers of species from the food chain, leading to impacts on the relevant ecosystems.

The Olbiil Era Kelulau finds that the use of bottom trawling has serious and possibly irreversible effects, including destruction of coral reefs and associated vulnerable species. There is concern about the effect on the fish stocks targeted and about the impacts on the biodiversity of the deep-sea marine environment, including in particular the destructive effects of such fishing on the coral reefs and related biodiversity of seamounts. Such fishing not only adversely impacts on targeted species

and on sedentary species attached to the coral reefs, but also impacts on mobile species dependent on the reefs for food and shelter. These impacts have motivated thousands of deep-sea scientists to state that scientific studies around the world have shown that bottom trawling is devastating to corals and sponges and to urge the United Nations and appropriate international bodies to establish a moratorium on bottom trawling on the high seas. The Olbiil Era Kelulau hereby states its support for such a global moratorium on bottom trawling.

The Olbiil Era Kelulau finds that coastal nations are permitted to regulate fishing within their Territorial Sea and EEZ. A number of countries have taken action to address deep-sea trawling on seamounts within their own waters. With this Act, Palau intends to prohibit its nationals, companies, and vessels from

engaging in bottom trawling anywhere in the world. With this Act, Palau also intends to prohibit anyone from engaging in bottom trawling within Palau's Territorial Sea and EEZ.

**Section 2. Definitions.** As used in this Act:

- (A) "Bottom trawling" means using a bottom trawl or similar towed nets operating in contact with the bottom of the sea; any fishing method which involves towing nets along the sea floor, as opposed to pelagic trawling, where the nets are towed higher in the water column. Bottom trawling could be practiced by one vessel or by multiple vessels fishing cooperatively.
- (B) "Exclusive economic zone or EEZ" means the zone that is 200 miles from the baselines from which the Territorial Sea is measured, which has specific legal characteristics as defined by Palauan and International Law.
- (C) "Palauan National" means any person claiming citizenship, whether sole or dual in the Republic of Palau.
- (D) "Palauan Vessel" means any ship, boat or other motor powered marine craft that is registered in or licensed in the Republic of Palau. For the purposes of this Act, it also mean any ship, boat or other motor powered marine craft that is owned in whole or in part by a Palauan National or Palauan business entity.
- (E) "Territorial sea" means the area established by the breadth of its territorial waters up to a limit not exceeding 12 miles, measured from baselines determined in accordance with Palauan and International Law.

**Section 3. Bottom trawling within Palauan waters and Palauan EEZ.**

- (A) It shall be unlawful to engage in or assist in bottom trawling in the territorial sea of the Republic of Palau.
- (B) It shall be unlawful to engage in or assist in bottom trawling in the Exclusive Economic Zone of the Republic of Palau.

**Section 4. Bottom trawling by Palauan Nationals, Companies, or Vessels.**

- (A) It shall be unlawful for any Palauan National to engage in or assist in bottom trawling, anywhere in the world.
- (B) It shall be unlawful for any business entity, regardless of type, which is registered in or otherwise licensed to do business in the Republic of Palau to engage in or assist in bottom trawling, anywhere in the world.
- (C) It shall be unlawful for any Palauan vessel to engage in or assist in bottom trawling, anywhere in the world.

**Section 5. Civil penalty.** Any person or business entity who engages in, or assists in bottom trawling in violation of this Act, or who allows their vessel(s) or equipment to be used for bottom trawling in violation of this Act, shall forfeit to the National Government of Palau such vessel(s) and equipment.

**Section 6. Criminal penalty.** Any person who engages in, or assists in bottom trawling in violation of this Act, shall upon conviction thereof, be imprisoned for not more than ten years and/or fined not more than five hundred thousand dollars (\$500,000.00). This criminal fine may be imposed against both individual persons, and against any business entity whose vessel(s) or equipment is used for bottom

trawling in violation of this Act. The criminal penalties are in addition to the civil penalties that may be due under this Act.

**Section 7. Effective date.** This Act shall take effect upon its approval by the President or upon its becoming law without such approval.

PASSED: March 09, 2006

Approved this 22nd day of MARCH, 2006.

\_\_\_\_\_  
/s/

Tommy E. Remengesau, Jr.

President

Republic of Palau

Palau Marine Mammal Sanctuary Enforcement and Legislation Workshop Report

Palau International Coral Reef Center

April 27, 2011

9:00am – 5:00pm

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*Prepared by Tiare Holm  
Sustainable Decisions  
Palau*

## I. Background and Overview

Located westernmost of the Pacific Islands sub-region known as Micronesia, the Republic of Palau is made up of 586 discreet islands within an exclusive economic zone (EEZ) covering 629,000 km<sup>2</sup>. The country's geographic proximity to Southeast Asia, combined with its relative isolation and geological diversity contribute to Palau's high rates of biodiversity and endemism. Palau is best known for its pristine, diverse, and abundant marine resources and special features that have anchored productive tourism and fisheries industries. With more than 30% of its near-shore areas in protection, and one of the region's first national sustainable finance mechanisms established to support protected areas management, the national government has extended protected area status to its entire EEZ with the 2009 declaration of the Palau National Shark Sanctuary, and again in 2010 with the establishment of the Palau National Marine Mammal Sanctuary.

Scientific research and management of marine mammals in Palau has historically been targeted primarily at Palau's population of dugong, one of the world's most isolated populations, now estimated at about 200 individuals. Dugongs are highly valued by Palau's communities as a traditional icon and historically as a delicacy reserved for special ceremonial occasions. National legislation banning all poaching, harassment, and capture of dugong in Palau has been in place for almost a decade, mandating a penalty of \$10,000 for offence. Continued poaching of dugong, along with the challenges linked to adequate enforcement, have prompted a review of the legislation and regulatory mechanisms that protect dugong in Palau. Recommendations for improved management are currently being developed and considered.

Scientific research targeting cetaceans in Palau and Micronesia has been relatively limited. Recorded sightings have been mainly anecdotal or limited to rapid ecological assessments, with no targeted research on cetaceans conducted to date. In July of 2010, a whale-watching feasibility study was conducted for Palau and noted that, "*The anecdotal presence of 15 species of cetaceans within a short distance from the barrier reef, and potentially up to 30 species of cetaceans, coupled with the existing marine tourism infrastructure indicates that with operator training, regulation and monitoring, and appropriate marketing, a whale and dolphin watching industry could be developed sustainably with little capital investment*" (Andrews, 2010). Cetacean species recorded from anecdotal sightings in Palau have included sperm whales, humpback whales, orca, false-killer whales, melon-headed whales, short-finned pilot whales, and at least two species of dolphins.

Whale-watching generates more than USD\$21 million for the region annually, with Palau's neighbor, Guam, generating approximately USD\$13 million annually in direct dolphin-watching revenues alone (IFAW, 2008). Palau is now working to optimize the sustainable management of its marine mammals as well as the associated economic benefits. As part of this effort in

October 2010, the national government declared all of the nation's waters, including the near-shore marine areas and EEZ, as National Marine Mammal Sanctuary during the 10<sup>th</sup> Conference of the Parties to the United Nations Convention on Biological Diversity in Nagoya, Japan (Palau National Government, 2010). Legislation to support the implementation of the national marine mammal sanctuary was introduced and is now undergoing review.

Adequate surveillance, enforcement, and compliance, is arguably Palau's most significant challenge in managing the National Shark and Marine Mammal Sanctuaries. Surveillance, enforcement, and compliance are the critical cornerstones for achieving sustainable management and optimizing cultural and economic benefits to Palau's communities and stakeholders. Too often, legislation for species protection is developed and passed with little input from the enforcement community on how to ensure adequate surveillance, enforcement, and compliance. In the effort to ensure meaningful feedback and recommendations from Palau's enforcement community for effectively managing marine mammals and enforcing Palau's national sanctuaries, a workshop was conducted on with key enforcement stakeholders at the national and state levels to share insights, ideas, and information on improving existing and proposed marine mammal legislation and implementing best strategies for effective enforcement and overall management. The workshop took place on April 27, 2011 at the Palau International Coral Reef Center.

## II. Workshop Agenda, Participants, and Objectives

The workshop agenda was developed through consultation with a small working group made up of the following key individuals directly involved with enforcement, compliance, and the development of legislation for marine mammal protection:

1. The Honorable Wayne Andrew, Delegate to the Palau National Congress
2. David Orrukem, Director of the Bureau of Marine Resources
3. Joshua Eberdong, Endangered Species Management Coordinator with the Bureau of Marine Resources
4. Ilebrang Olkeriil, Director of Koror State Conservation and Law Enforcement
5. Mandy Etpison, Director of the Etpison Museum and Coordinator for the Palau Year of the Dugong
6. Tiare Holm, Director of Sustainable Decisions and Coordinator of the Palau Cetacean Policy Project for Pew Charitable Trusts and the South Pacific Whales Research Foundation
7. Asap Bukurrou, Marine Conservationist and Community Facilitator with Sustainable Decisions

Workshop participants included representatives from state and national enforcement agencies, the Palau Office of the Attorney General, and key stakeholders involved in marine mammal protection. Agencies represented included:

1. The Palau National Congress
2. The Palau Office of the Attorney General
3. The Bureau of Marine Resources
4. The Bureau of Fish and Wildlife Protection
5. The Bureau of Marine Law Enforcement
6. The Palau Environmental Quality Protection Board
7. Koror State
8. Peleliu State
9. Hatohobei State
10. Airai State
11. Ngardmau State
12. Ngerchelong State

Workshop objectives were developed and agreed as follows:

1. Gain feedback on the barriers, challenges and solutions to effective enforcement of the existing and proposed dugong and marine mammal legislation
2. Inform the legislation and rules and regulations being proposed for dugong and marine mammal management.
3. Gain additional information on marine mammals in Palau from the enforcement community
4. Build collaboration between enforcement agencies for effective monitoring, enforcement, reporting and data management.
5. Develop standard protocols for reporting sightings, violations, and other enforcement activities.
6. Build awareness of enforcement officers on marine mammals and related issues

### III. Summary of Discussions

Facilitated by Mr. Asap Bukurrou, the workshop began with welcoming remarks delivered from The Honorable Harry R. Fritz, Minister of Natural Resources, Environment, and Tourism. During his remarks, the Minister highlighted the Palau Year of the Dugong, the establishment of the Marine Mammal Sanctuary, and the achievements and participation of the Palau National Government in various international meetings including the Conference of the Parties to the

Convention on Biological Diversity, the Convention on the International Trade of Endangered Species, and the International Forum on Dugong Conservation.

Following the Minister's welcoming remarks, participants were facilitated through a "road-mapping" review of the workshop objectives and agenda for final approval.

A presentation was then delivered to provide an overview of marine mammal management issues in Palau and in the Pacific Islands region. The presentation highlighted the economic benefits enjoyed by the region in sustainable marine-mammal based tourism. Conservation actions in the region include the establishment of national marine mammal sanctuaries in 15 Pacific island countries and territories. In October 2010, Palau joined the effort to conserve the region's marine mammals when the President declared all of Palau's waters, an area encompassing 230,000 million sq miles (an area approximately the size of France). In November 2010, legislation was introduced in the House of Delegates by Delegate Wayne Andrew, to support the effective management and implementation of Palau's national marine mammal sanctuary.

It was noted that while significant research had been undertaken to determine population size, distribution, and behavior of Palau's Dugongs, targeted research to determine the presence, population sizes, distribution, and behavior of cetaceans has been limited to opportunistic observations associated with rapid ecological assessments and monitoring of near-shore marine protected areas. In July of 2010, an initial feasibility study was conducted to identify marine mammals species observed scientifically and anecdotally to be present in Palau. At least 15 species were confirmed and recommendations were made to cultivate a sustainable marine-mammal based tourism industry in Palau that contributes to the effective implementation and management of the Palau National Marine Mammal Sanctuary.

Following the presentation on regional and national marine mammal issues in Palau and the Pacific Islands, Palau's key enforcement agencies shared their mandates and roles in the management of marine mammals.

### **Marine Law Enforcement**

Based in the Ministry of Justice, the main role of the Division of Marine Law Enforcement is to enforce national fisheries laws and regulations, particularly beyond the 12 mile state territorial waters within Palau's exclusive economic zone (EEZ). The Division also works in collaboration with international partners to undertake search and rescue with Palau's EEZ. Surveillance of Palau's EEZ is conducted with bilateral support from Palau's development partners and currently the Division patrols the EEZ with support from the Australian Navy. Officers on patrol boats are outfitted with side-arms.



The Division of Marine Law Enforcement was established through legislation that abolished the former Water Safety Board and transferred its functions. The Division also is responsible for registering boats for hire, and its role is sometimes questioned because of confusion over transportation licensing.

When a vessel is found conducting activities in violation of Palau's national fisheries laws, the vessel is captured and brought to shore. Inventory is then taken, illegal catch is destroyed, and individuals are arrested. Data on the inventory is then turned over to the Attorney General's office and entered into a database kept by the Division. Cases are usually settled before going to trial.

The biggest challenge that the Division faces is the deployment of the patrol boats for monthly 15-day patrol because of reduced budgets, particularly budget items related to fuel and boat maintenance, and difficulties within the procurement process for fuel. It is not uncommon for vendors to withhold fuel because of the national government's outstanding balances and unpaid bills. This often prevents the Division from carrying out its regular patrol.

The Division plays a supporting role to the Division of Fish and Wildlife in terms of the management of dugongs and other protected species. Because Cetaceans are often found in more distant waters, the Division will likely play a stronger role in enforcing the Marine Mammal Sanctuary within Palau'

### **Bureau of Marine Resources**

Made up of two divisions, Coastal Fisheries and Oceanic Fisheries, the Bureau of Marine Resources (BMR) is established by Executive Order 23. One of the Bureau's mandates is to manage endangered marine mammal species such as Palau's Dugong, one of the world's two most isolated populations. Challenges regarding Dugong management include the lack of rules and regulations as well as challenges in data management. BMR staff also have difficulty in understanding protocols relating to dugong management and monitoring because protocols are vague or non-existent. It was noted that there is a need to improve protocols and collaboration between BMR and the States. Perhaps the biggest challenge faced by the Bureau is limited resources to effectively fulfill its role and barriers to collaborating effectively with other regulatory agencies. Most of the Bureau's endangered species management responsibilities, including those related to dugong, rest with Joshua Eberdong. A database for dugongs has been recently established.

### **Division of Fish and Wildlife**

The main function of the Division of Fish and Wildlife (DFW), based in the Ministry of Justice within the Bureau of Public Safety, is to protect, preserve, and enforce laws relating to endangered species. Currently the Division is focusing on how to monitor and enforce dugong laws effectively. Part of this focus involves working with Ministry of Education to improve education on dugong in schools. The greatest challenge is limited resources. The Division has recently been instructed to lessen monitoring because of lack of funds for fuel. The same poachers are known to hunt dugong every year and they have learned when to poach with least risk and highest chance of successful hunt. Incidences are reported but the information cannot be shared because it is considered confidential until it is proven that dugongs (or other endangered species have been taken). Poachers have become experts and tend to increase activity during breeding seasons. Although the best way to monitor is by helicopter there are no funds to use this method. DFW works to collaborate with others to implement community and student education programs

### **Koror State Conservation Law Enforcement**

The Koror State Conservation Law Enforcement Department enforces all Koror state conservation laws. No state laws specifically targeted at dugongs and marine mammals currently exist. The Department supports national government agencies in dugong and marine mammal work. The greatest challenge is limited capacity to adequately undertake marine mammal monitoring and enforcement. Challenges also include determining a clear protocol for communicating and reporting sightings and violations. Currently, there is a monitoring plan but it is not being implemented. The Department would like to collaborate with national agencies on monitoring and reporting, but does not maintain a database on sightings and violations. The areas that are known as critical habitat can be regulated as protected areas

### **Hatohobei State**

Dugong has been found in Pulo Anna some time back but sightings are very rare, however sightings of whales and dolphins are common. The stranding of a large whale occurred about 3 or 4 years ago. The length of the whale was about sixty feet long. Hatohobei State Conservation enforcement program serves as the “eyes and ears” for the national government at Helen and Hatohobei Island and surrounding waters. The State contacts national agencies to report violations, however the protocol for handling sightings is unclear.

Following the presentations from agencies, the workshop participants broke into groups to discuss recommendations for:

1. Protocol for reporting
2. Protocol for data management
3. Interagency Collaboration

The following discussion items were reported from each group.

### **Group 1**

Reporting violations:

- To BMR during working hours (in accordance with existing statute)
- To DFW and State government agencies during non-working hours
- DFW will notify BMR of reports they receive

Reporting sightings:

- An agreed sightings form is needed to be distributed to all relevant agencies as well as the tourism community
- Reporting should include date, time and place

Database:

- Should be located at and management by BMR

Collaboration

- Public awareness and educating the public through the media and schools. Could include collaborative participation in radio and tv talk shows. Posters, brochures, and bumper stickers should be developed and produced
- Possible creation of an NGO specifically aimed at coordinating with the relevant ministries and agencies on the issue of marine mammals

### **Group 2**

Reporting sightings and violations:

- Best to have one phone number on educational materials. Should use DFW's 24 hour phone line.
- DFW to record information on sighting form and communicate information as soon as possible to BMR
- Also encourage communities to go to local enforcement agencies to report sightings and violations, to strengthen engagement at state level and improve collaboration between state and national agencies
- Also agree that agreed sighting forms are needed
- Important to give sighting forms to local fishermen

- Need to address the issue of adequate resources and support for DFW and other agencies to fulfill responsibilities
- Need to have training and awareness program across all enforcement agencies on the laws, rules and regulations as soon as legislation is adopted. A national workshop for all enforcement agencies focused on conservation legislation is recommended.
- Data management to remain with BMR

### **Group 3**

Protocol for reporting sightings and violations:

- Should use DFW's 24 hour number for public education purposes
- DFW should immediately report to BMR
- Need to enable community to secure carcass of dugong and other marine mammals through legislation
- BMR should notify State agencies, which should be present for any autopsy or other investigation activities
- State agencies should notify DFW, who notifies BMR
- Reporting and disposal protocol needs to be very clear
- BMR to be responsible for securing and disposal
- Should record activity at the time of sightings (breeding, feeding, etc.)
- Collaborate with Dolphins Pacific (they have experts...)
- Participate in public forums like OBF and Earth Day
- Effectively collaborate with stakeholders and state agencies – recommend that incentives from penalties derived be also shared with states.
- Database and data management to remain with BMR
- Need to develop Interagency MOUs to clarify protocols, roles, and means for collaboration
- DFW to collect data it needs then defer report to BMR
- BMR needs to be at the site for data collection with DFW
- Need to have regulations that clearly define roles of state agencies and governments

Following the group reports, Delegate Andrew delivered a presentation on the legislation introduced to support dugong management and the implementation and management of the Palau National Marine Mammal Sanctuary. The legislation proposes the following changes.

Dugong bill:

- Increases penalty to \$ 25,000

MMS Bill:

- Extends the same protection measures to all marine mammals
- \$25,000 penalty on first violation, \$35,000 penalty after
- Need recommendations on how to improve legislation

Feedback from the workshop participants included the following points

1. Need to have adequate resources
2. Enforcement presence is strongest deterrent
3. Need to empower state enforcement officers
4. Need letters of support from agencies and states for legislation
5. Need to extend penalties to people who order the dugong meat
6. Target younger generations for intense education campaign

Workshop Participants then discussed and agreed to a set of clear recommendations to improve marine mammal legislation, management, and enforcement (*see appendix A*).

Before adjourning, participants collaboratively reviewed and approved the layout and content for a poster to raise awareness on Palau's National Marine Mammal Sanctuary (*see appendix B*).

## References

Andrews, O. (2010). *Feasibility of Whale and Dolphin Watching Tourism in Palau*. Koror, Palau: The Pew Charitable Trusts.

O'Connor, S. (2008). *Pacific Islands whale watch tourism: A region wide review of activity*. Noble Park, VIC: IFAW.

Office of the President. (Palau National Government). Presidential Declaration No. 10-14.

## Agreed Recommendations

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### **Protocol for Reporting:**

1. All public and agencies to be advised to report sightings and violations to the DFW 24 hour hotline
2. Agencies and public also advised to report sightings to BMR during working hours
3. DFW will immediately communicate reports of sightings and violations to BMR and relevant State agencies, which should be present for any autopsy or other investigation activities
4. BMR will develop and communicate a clear protocol for collecting samples for testing, data collection, and preservation
5. BMR and DFW will develop clear disposal protocol
6. BMR and DFW will collaborate to develop agreed sightings forms and enter into MOU to clarify roles, responsibilities, and means for collaboration
7. Sighting and data collection (including sample collection) forms will be distributed to all relevant agencies (State and national) and tourism community and local fishermen

### **Protocol for Data Management:**

1. Data base on violations to be housed at and managed by DFW
2. Database on sightings and other information to be housed at and managed by BMR
3. DFW and BMR will collaborate with PICRC and other technical partners to synergize and enhance data management activities

### **Collaboration:**

1. Public awareness and educating the public through the media and schools. Could include collaborative participation in radio and tv talk shows. Posters, brochures, and bumper stickers should be developed and produced
2. Possible creation of an NGO specifically aimed at coordinating with the relevant ministries and agencies on the issue of marine mammals

### **Other recommendations:**

1. Need to address the issue of adequate resources and support for DFW and other agencies to fulfill responsibilities
2. Need to have training and awareness program across all enforcement agencies on the laws, rules and regulations as soon as legislation is adopted. A national workshop for all enforcement agencies focused on conservation legislation is recommended.

3. Need to enable community to secure carcass of dugong and other marine mammals through legislation
4. Collaborate with Dolphins Pacific (they have experts...)
5. Participate in public forums like OBF and Earth Day
6. Effectively collaborate with stakeholders and state agencies – recommend that incentives from penalties derived be also shared with states.
7. Need to develop Interagency MOUs to clarify protocols, roles, and means for collaboration
8. Need to have regulations that clearly define roles of state agencies and governments and a permitting and registration process

**Resources needed:**

1. Adequate funding to enforcement agencies
2. Enforcement capacity
3. Education and Awareness expanded to be more targeted at states outside of Koror and different audiences
4. Tracking capacity, such as non-invasive survey methods and working with regional agencies
5. Boats for monitoring and surveillance
6. GPS units
7. Reliable communication devices
8. Database equipment, software, capacity, and staff
9. Fuel for helicopter patrol
10. Fuel for boats
11. Effective collaboration
12. Surveillance cameras
13. Task Force to discuss patrolling high incidence areas during high incidence times

**Recommendations for legislation:**

1. Enable community members to properly secure marine mammals that have been killed or injured
2. Identify agencies that will handle disposal, as well as methods (case to case)
3. Fee distribution to be shared with individuals who report, states, and national agencies
4. Access PAN funding to support monitoring and enforcement aspects of legislation
5. Empower officers at State levels to enforce national laws and ensure they have resources need from PAN
6. Need to develop adequate rules and regulations. This will be undertaken by heads of agencies with support from their partners.



7. Need to address issue of marine mammal parts
8. Clarify intent of marine mammal legislation within the context of the EEZ and the fact that this component is more aimed at commercial fisheries than local Palauans
9. Agencies should propose adequate budgets to access funds from PAN
10. Database management should be mentioned or addressed in legislation
11. Adequate education at all local levels should be integrated into legislation
12. Engage hunters in conservation programs
13. Increasing fines may not be necessary. Makes more sense to increase jail time as a deterrent
14. Target more education specifically at hunters and fishermen
15. Increase rewards for reporting
16. Increase resources for regulating agencies
17. Relevant agencies should seek ways to meet and collaborate regularly, such as regular informal or formal meetings and get-togethers. BMR to take the initial lead on this.

Appendix B

**Dongulle Domkereru**  
support our Palau Marine Mammal Sanctuary

**SD** Sustainable Development

**2011** DUGONG RESEARCH AND PROTECT

**Mesekiu** SAVE PALAU'S DUGONGS

**WHALES ALIVE**

If you find a dead marine mammal (or see someone killing one), please report to \_\_\_\_\_ / 4881 \_\_\_\_\_  
please report any marine mammal sightings to the Bureau of Marine Resources for their 458888: 4880- \_\_\_\_\_



**Republic of Palau**  
*Office of the President*

**JOHNSON TORIBIONG**  
*President*

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**PRESIDENTIAL DECLARATION NO. 10-14**

***PALAU DECLARATION ON THE ESTABLISHMENT  
OF A MARINE MAMMAL SANCTUARY***

**October 2010**

**RECOGNIZING** that the people of the Republic of Palau have a special relationship with marine mammals, particularly dugong, that spans many generations;

**ACKNOWLEDGING** that Palau's population of dugong are the most isolated and endangered population in the world; and, that there are at least 11 species of whales including a breeding population of Sperm Whales and possibly as many as 30 species that utilize Palau's Exclusive Economic Zone; and, that much more scientific research needs to be conducted to gain clear insight into the populations, behaviors, and needs of marine mammals that are present in Palau's waters;

**APPRECIATING FURTHER** that the hunting of marine mammals in the 18th, 19th and 20th centuries has dramatically reduced populations in the Pacific Islands Region; and, that the International Whaling Commission recognizes that there is clear scientific evidence that in the Pacific Islands region many of the great whale species remain severely depleted in numbers;

**ACKNOWLEDGING** that it is a well-established scientific principle that, to protect migratory species, it is necessary to protect them not only in their feeding areas and migratory routes but also in their breeding grounds;

**REAFFIRMING** Principle 2 of the Declaration of the United Nations Conference on the Human Environment adopted at Stockholm in 1972 that "the natural resources of the earth, including the air, water, land, flora and fauna and especially representative samples of natural ecosystems, must be safeguarded for the benefit of present and future generations through careful planning or management, as appropriate";

**NOTING** that the contracting parties to the Convention on Biological Diversity further noted that the fundamental requirement for the conservation of biological diversity is the in-situ conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings

**RECOGNIZING** the right of a coastal State under the United Nations Convention on the Law of the Sea to strictly prohibit, limit or regulate the exploitation of marine mammals within its Exclusive Economic Zone;



**BEARING IN MIND** that 11 Pacific Island Forum members have taken steps to effect protection of whales within their national Exclusive Economic Zones and two entities in Micronesia (Guam and the Commonwealth of the Northern Marianas Islands) have fully protected marine mammals within their waters, and that other Pacific Island countries might wish to consider similar action, in which case appropriate regional and international technical support could be made available;

**NOTING** further the Regional Marine Mammals Conservation Programme being currently undertaken by the South Pacific Regional Environment Programme and, in particular, the benefits in the sharing of information across the region; and

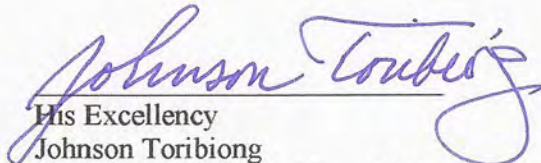
**REAFFIRMING** the Government of the Republic of Palau's long standing position in support of biodiversity conservation and the use of sanctuaries and protected areas in achieving sustainable development goals and in recognition of the fact that sanctuaries are the most effective conservation, research and management measure for marine mammals;

**THE GOVERNMENT OF THE REPUBLIC OF PALAU HEREBY DECLARES:**

1. The exclusive economic zone of the Republic of Palau a Sanctuary for all marine mammals.
2. The purpose of the Sanctuary is to contribute towards the protection of marine mammals by prohibiting the deliberate hunting and harassment of marine mammals.
3. Any accidental capture of or injury to a marine mammal during fishing operations and the utilization of stranded marine mammal carcasses in the Exclusive Economic Zone will require to be reported to the Bureau of Marine Resources within the Ministry of Natural Resources, Environment, and Tourism.
4. The creation of a marine mammal sanctuary in the Republic of Palau is a proactive management measure that will support the following activities:
  - i. Non-lethal scientific research;
  - ii. Collaboration for information exchange, education and awareness initiatives;
  - iii. Monitoring of marine mammals;
  - iv. Identification of future threats to marine mammals and appropriate action to counter those threats; and
  - v. Development of mechanisms for the regular evaluation of management programmes in terms of appropriate objectives.



**PURSUANT** to the authority vested in me by Article VIII, § 7 and Article VI of the Constitution of the Republic of Palau, I have hereunto set my hand and seal this 22<sup>nd</sup> day of October 2010, acknowledged by the Honorable Harry Fritz, Minister of Natural Resources, Environment and Tourism.

  
His Excellency  
Johnson Toribiong  
President of the Republic of Palau

October 2010  
Koror, Palau

\_\_\_\_\_  
The Honorable Harry Fritz  
Minister of Natural Resources, Environment, and Tourism

October 2010  
Nagoya, Japan  
CBD COP 10



# Koror State Government

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September 7, 2007

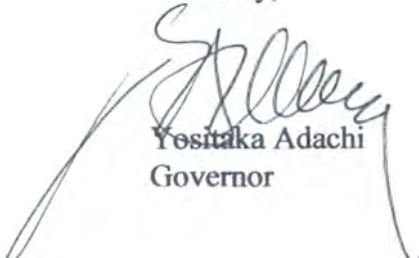
The Honorable Timothy "Tero" Uehara  
Speaker  
Eighth Koror State Legislature  
Republic of Palau

Re: KSPL No. K8-186-2007 (Bill No. 8-28,LD1)

Dear Mr. Speaker:

I have the honor of transmitting to you Koror State Public Law No. K8-186-2007, a Bill for an Act to prohibit the feeding of sharks in the waters of the State of Koror, passed by the Legislature as Bill No. 8-28,LD1

Sincerely,



Yositaka Adachi  
Governor

BILL NO:

# EIGHTH KOROR STATE LEGISLATURE

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## A BILL

To ban shark feeding in the waters of the State of Koror, to provide penalties for violations of this Act, and for related purposes.

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INTRODUCED BY: Legislator Toribiong Masang

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## LEGISLATIVE ACTION

DATE INTRODUCED: August 10, 2007

COMMITTEE REFERRAL: Resources and Development

COMMITTEE REPORT NO: 8-24

REPORT DATE: August 29, 2007

PASSED ON: August 29, 2007

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**AN ACT**

To ban shark feeding in the waters of the State of Koror, to provide penalties for violations of this Act, and for related purposes.

THE PEOPLE OF KOROR REPRESENTED IN THE LEGISLATURE OF THE STATE OF KOROR DO ENACT AS FOLLOWS:

**SECTION 1. FINDINGS.**

The Eighth Koror State Legislature hereby finds that the practice of shark feeding has increased in Koror and all over the world, and that there are legitimate concerns about whether or not such practices increase risks of shark attacks on swimmers. During such feedings, sharks are usually aroused into a "frenzied" state in their search for food, which may pose a risk for persons close to feeding activities. It is also apparent that shark feeding practices teach sharks to associate humans with food, which may cause sharks to approach innocent swimmers who may be feeding small fish. Some areas have banned or restricted shark feeding as the result of increased attacks, and some areas have reported that shark attacks have decreased as the result of banning shark feeding. The Legislature has also been informed that a tourist in Koror was actually bitten by a shark while tourists were observing shark feeding activities in the waters of Koror.

Because of the potential for unintentional attacks, and because many dive and swim sites are at least one hour or more from medical assistance, the Eighth Koror State Legislature feels that it is in the best interests of the people of Palau, and visitors to Palau, to prohibit shark feeding in the waters of the State of Koror.

**SECTION 2. SHARK FEEDING PROHIBITED.**

It shall be unlawful to feed sharks in the waters of the State of Koror. If a person is



violate any provision of this Act, shall, upon conviction, be guilty of a misdemeanor, and shall pay a fine in the amount of \$100.00, and such person may also be sentenced to spend up to ninety (90) days in jail.

C. If any person is injured as the result of any violation of this Act, the court shall impose mandatory jail time as part of the sentence, and the offender shall be ordered to pay restitution to any victim.

**SECTION 4. REGULATIONS.**

The Governor is hereby authorized to promulgate regulations for the implementation of this Act, and to take steps for public awareness and public education.

**SECTION 5. SEVERABILITY.**

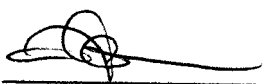
The provisions of this Act are severable. If any part or portion of this Act is held to be invalid or unenforceable, then the offending portions may be stricken and the remaining portions shall continue in full force and effect.

**SECTION 6. EFFECTIVE DATE.**

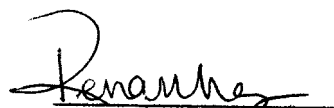
This Act shall become effective upon its becoming law of the State of Koror by operation of the Koror State constitution.

**PASSED ON : August 29, 2007**

**CERTIFIED BY:**

  
Timothy "Tero" Uehara  
Speaker

**ATTESTED TO BY:**

  
Rena Iluches  
Clerk

(Q) "Non-Point Source" means any origin from which pollutants emanate in an unconfined and unchanneled manner including but not limited to surface runoff and leachate seeps.

(R) "Off-Shore Waters" means all coastal waters beyond the limit defined for "near-shore" waters.

(S) *"Ordinary High Water Mark" shall mean that line upon the shore or bank established by fluctuations of water and indicated by physical characteristics, such as a clear natural line impressed on the bank, destruction of terrestrial vegetation, the presence of litter or debris, or other appropriate means.\**

(T) "Outstanding National Resource Waters" means the waters of national spawning grounds, preserves, and waters of exceptional recreational or ecological significance.

(U) "Person" means the Republic of Palau, a state, a political subdivision, a public or private institution, corporation, partnership, joint venture, association, firm or company organized or existing under the Laws of Palau or of any state or country, a lessee or other occupant of property, or any individual, acting singly or as a group.

(V) "Point Source" means any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, vessel or other floating craft from which pollutants are or may be discharged.

(W) "Pollutant" means but is not limited to dredged spoil, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical waste, biological material, radioactive materials, heat, wrecked or discarded equipment, rock, sand, and industrial, municipal and agricultural waste.

(X) "Pollutant Discharge" means either a point source or non-point source of pollutant discharge.

(Y) "Pollutant Discharge Permit" means any Republic of Palau Environmental Quality Protection Board Pollutant Discharge Permit issued pursuant to Sections 2401-11-21 through 2401-11-36, inclusive, of the Republic of Palau Environmental Quality Protection Board Marine and Fresh Water Quality Regulations.

(Z) *"Stream" shall mean a flowing body of fresh water that persists throughout most of the year, except under conditions of drought, and has a visually-defined bed and bank or "ordinary high water mark."\**

(AA) "Surface Water" means any water as found on the surface of the earth or under the influence of run off or other water.

(BB) *"Swamp Forest" shall mean a forest that occur where soils are flooded most of the year with fresh or slightly brackish water.\**

(CC) *"Undue Hardship" shall mean that the owner of the land has been denied all beneficial uses of the property that includes the buffer zone.\**

(DD) "Water Quality Certification" means a statement which asserts that a proposed discharge activity will not violate applicable water quality standards.

(EE) "Water Quality Standards" means standards established for any and all waters located within the Republic of Palau.

(FF) "Wetlands" means those areas that are inundated or saturated with surface or groundwater at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include saltwater swamps, freshwater/marshes, and cultivated wetlands. These waters shall be classified as surface water.

(Effective May 26, 1996)

(Amendment Effective September 15, 1999)

## WATER USE CLASSIFICATION

### **2401-11-05 Classification of Coastal Water Uses**

Coastal waters are classified in accordance with uses to be protected in each class as follows:

(A) Class AA Waters.

(1) The uses to be protected in this class of water are oceanographic research, the support and propagation of shellfish and other marine life, conservation of coral reefs and wilderness areas, compatible recreation and other aesthetic enjoyment.

(2) It is the objective that this class of waters remain as near to their natural state as possible with an absolute minimum of pollution from any source.

(3) To the extent possible, the wilderness character of such areas shall be protected. No point source discharge will be permitted in these waters, nor will destruction of reefs, aquatic habitats or other resources be permitted.

(4) The classification of any water areas as Class AA shall not preclude other uses of such waters compatible with these objectives and in conformance with the standards applicable to them.

(B) Class A Waters.

(1) The uses to be protected in this class of waters are recreational (including fishing, swimming, bathing, and other water contact sports), aesthetic enjoyment, and the support and propagation of aquatic life.

(2) It is the objective that in this class of waters, use for recreational purposes and aesthetic enjoyment shall not be limited in any way.

(3) Class A waters shall be kept clean of any trash, solid materials and oil, and shall not act as receiving waters for any effluent which has not received the highest degree of treatment or control practicable under existing technological and economic conditions and shall be compatible with the standards established for this class.

(C) Class B Waters.

(1) The uses to be protected in this class of waters are small boat harbors, commercial and industrial shipping, bait fishing, compatible recreation, *over-water commercial or residential structures for recreational or domestic use\**, the support and propagation of aquatic life, and aesthetic enjoyment.

(2) It is the objective for this class of waters that discharge of any pollutant be controlled to the maximum extent possible and that sewage and industrial effluent receive the highest degree of treatment practicable under existing technological and economic conditions,

and shall be compatible with the standards established for this class.

(3) The Class B designation should apply only to a limited area next to boat docking facilities. *No coastal areas with a coastal mangrove fringe greater than 50 feet in width shall be classified as Class B waters after the effective date of this amendment.\**

(4) The rest of the water area in such bay or harbor not falling within the area identified in the previous paragraph shall be Class A unless given some other specific designation.

(Effective May 26, 1996)  
\*(Amendment Effective May 18, 1998)

#### **2401-11-06 Classification of Fresh Water Uses**

Fresh waters are classified in accordance with the uses to be protected as follows:

(A) Class 1 Waters.

(1) The uses to be protected in this class of waters are drinking water supply, food processing, the support and propagation of aquatic life, and compatible recreation.

(2) It is the objective that this class of waters remain in as near their natural state as possible with an absolute minimum of pollution from any source. To the extent possible, the wilderness character of such areas shall be protected. Waste discharge into these waters is prohibited.

(B) Class 2 Waters.

(1) The uses to be protected in this class of waters are bathing, swimming, the support and propagation of aquatic life, compatible recreation, and agricultural water supply.

(2) It is the objective for this class of waters that their use for recreational purposes, propagation of fish and other aquatic life and agricultural and industrial water supply not be limited in any way. Such waters shall be kept clean of trash, solid waste materials and oils and shall not act as receiving waters for any effluent which has not received the highest degree of treatment or control practicable under existing technological and economic conditions, and shall be compatible with the standards established for this class.

(Effective May 26, 1996)

#### **2401-11-07 Classification of Groundwater**

(A) Class I: Special Groundwater are those that are highly vulnerable to contamination because of the hydrological characteristics of the areas under which they occur and that are also characterized by either of the following two factors:

(1) Irreplaceable, in that no reasonable alternative source of drinking water is available to substantial populations; or

(2) Ecologically Vital, in that the aquifer provides the base flow for a particularly sensitive ecological system that, if polluted, would destroy a unique habitat.

(B) Class II: Current and potential sources of drinking water and waters having other beneficial uses and all other groundwater that are currently used or are

potentially available for drinking water or other beneficial use.

(C) Class III: Groundwater not considered potential sources of drinking water and of limited beneficial uses are groundwater that are heavily saline, with total dissolved solids levels over 10,000 mg/l or are otherwise contaminated beyond levels that allow cleanup using methods reasonably employed in public water system treatment. These groundwater also must not migrate to Class I or II groundwater or have a discharge to surface water that could cause degradation.

(Effective May 26, 1996)

#### **2401-11-08 Classification of Groundwater Areas**

(A) Class I Groundwater Areas: All sources of fresh groundwater on all islands whether publicly or privately owned, used or potentially used, for domestic, culinary or food processing purposes.

(B) Class II Groundwater Areas: All fresh groundwater not included in Class I or Class III.

(C) Class III Groundwater Areas: All groundwater not considered potential sources of drinking water and of limited beneficial use which are heavily saline, with total dissolved solids levels over 10,000 mg/l, or which are otherwise contaminated beyond levels that allow cleanup using methods reasonably employed in public water system treatment.

(Effective May 26, 1996)

### **WATER QUALITY STANDARDS**

#### **2401-11-09 Basic Criteria Applicable to All Waters**

(A) All waters shall be capable of supporting desirable aquatic life and shall be suitable for recreation in and on the water.

(B) In furtherance of the goal set forth in Division A of this Section, all waters shall be:

(1) Free of visible floating materials, oils, greases, scum and other floating matter attributable to human activities;

(2) Free from materials attributable to sewage, industrial waste or other human activities that produce visible turbidity or settle out to form deposits;

(3) Free from materials attributable to sewage, industrial waste or other human activities that produce objectionable color, odor or taste directly or by chemical or biological action with the water or the life forms in the water;

(4) Free from substances attributable to human activities that induce undesirable aquatic life or degrade the indigenous biota;

(5) Maintained free of toxic substances in concentrations that are toxic to or that produce detrimental physiological responses in human, plant, animal, or aquatic life. Compliance with this objective will be determined by use of indicator organisms, analysis of species diversity, population density, growth anomalies, bioassay of appropriate duration or other

appropriate methods as specified by the Board. The survival of aquatic life in waters subjected to waste discharge or other controllable water quality factors shall not be less than that for the same water body in areas unaffected by the waste discharge, or when necessary for other control water that is consistent with the requirements for "experimental water" as described in *Standard Methods for the Examination of Water and Wastewater*, latest edition. As a minimum, compliance with this objective as stated in the previous sentence shall be evaluated with a ninety-six (96) hour bioassay; and,

(6) The Board shall apply natural background levels in place of specified water quality criteria standards if natural background water quality is better than that specified in other provisions of the standards in order to preserve the water quality found in the natural state to prevent the degradation of natural conditions and implement the anti-degradation provisions in Section 2401-11-03. [See: Section 2401-11-20(C)].

(Effective May 26, 1996)

**2401-11-10 Microbiological Standards**

| STANDARD                                                                                                                                                          | APPLICABLE CLASSES |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| (A) The median total or fecal coliform bacteria count shall not exceed 70/100ml for any 10 consecutive samples nor shall any single sample exceed 230/100 ml.     | AA and 1           |
| (B) Fecal Coliform count shall not exceed a geometric mean of 200/100ml for any 10 consecutive samples nor shall any single sample exceed 400/100 ml.             | A, B and 2         |
| (C) Enterococci count shall not exceed a geometric mean of 33/100ml for any 5 samples in a given 30 day period nor shall any single sample shall exceed 60/100ml. | AA and A           |
| (D) In areas where shellfish are harvested for human consumption, the micro-biological standards for Class AA and 1 Waters shall apply.                           | A, B and 2         |

(Effective May 26, 1996)

**2401-11-11 pH Standards**

| STANDARD                                                             | APPLICABLE CLASSES |
|----------------------------------------------------------------------|--------------------|
| (A) pH variation shall be within 7.7 and 8.5 pH units.               | AA, A and B        |
| (B) pH variation shall not be greater than 0.2 pH units from natural | 1                  |

|                                                                                                                                                                            |   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| conditions; but not lower than a pH of 6.5 or higher than a pH of 8.5 from other than natural causes.                                                                      |   |
| (C) pH variation shall not be greater than 0.5 pH units from natural conditions; but not lower than a pH of 6.5 or higher than a pH of 8.5 from other than natural causes. | 2 |

(Effective May 26, 1996)

**2401-11-12 Nutrient Material**

| STANDARD                                                                                                                  | APPLICABLE CLASSES                                                                       |
|---------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| (A) The ratio of total nitrogen to total phosphorus concentration shall be within:                                        |                                                                                          |
| (1) 11.1 - 27.1                                                                                                           | AA and A                                                                                 |
| (2) 6.1 - 18.1                                                                                                            | B                                                                                        |
| (3) 10% variation of the naturally occurring ratio                                                                        | 1 and 2                                                                                  |
| (B) The concentration of total nitrogen and total phosphorus shall not vary by more than 10% from the natural conditions. | All Waters                                                                               |
| (C) Except for concentrations attributable to natural causes nutrient concentration shall not exceed:                     |                                                                                          |
| (1) Total Phosphorus                                                                                                      |                                                                                          |
| (a) 0.025 mg/l as P                                                                                                       | AA and A                                                                                 |
| (b) 0.500 mg/l as P                                                                                                       | B                                                                                        |
| (c) 0.200 mg/l as P                                                                                                       | 1 and 2                                                                                  |
| (d) 0.050 mg/l as P                                                                                                       | Fresh Waters entering lakes or reservoirs (at a point of entry) and lakes and reservoirs |
| (2) Total Nitrogen                                                                                                        |                                                                                          |
| (a) 0.400 mg/l as N                                                                                                       | AA and A                                                                                 |
| (b) 0.800 mg/l as N                                                                                                       | B                                                                                        |
| (c) 0.750 mg/l as N                                                                                                       | 1                                                                                        |
| (d) 0.500 mg/l as N                                                                                                       | 2                                                                                        |

(Effective May 26, 1996)

**2401-11-13 Dissolved Oxygen**

| <u>STANDARD</u>                                                                                                     | <u>APPLICABLE CLASSES</u> |
|---------------------------------------------------------------------------------------------------------------------|---------------------------|
| (A) Dissolved oxygen concentrations shall not vary by more than 25% from natural conditions.                        | All Waters                |
| (B) Except for concentrations attributable to natural causes dissolved oxygen concentration shall not be less than: |                           |
| (1) The greater of 6.0 mg/l, 75% or Saturation                                                                      | AA and 1                  |
| (2) 5.0 mg/l                                                                                                        | A and 2                   |
| (3) 4.5 mg/l                                                                                                        | B                         |

(Effective May 26, 1996)

**2401-11-14 Total Dissolved Solids, Salinity, Currents**

| <u>STANDARD</u>                                                                                                                                                                                                                                                                                                                             | <u>APPLICABLE CLASSES</u> |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| No change in channels, basin geometry or water influx shall be made which would cause permanent changes in isohaline patterns of more than 10% from natural conditions or change in salinity outside the range of 29-35 parts per thousand or which would otherwise adversely affect the indigenous biota and natural sedimentary patterns. | All Waters                |

(Effective May 26, 1996)

**2401-11-15 Temperature**

| <u>STANDARD</u>                                                                                                                            | <u>APPLICABLE CLASSES</u> |
|--------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| Temperature shall not vary by more than 1.5 degree Fahrenheit (0.9 degree Celsius) from the natural conditions in marine and fresh waters. | All Waters                |

(Effective May 26, 1996)

**2401-11-16 Turbidity**

| <u>STANDARD</u>                                                            | <u>APPLICABLE CLASSES</u> |
|----------------------------------------------------------------------------|---------------------------|
| Turbidity as measured by Nephelometric Turbidity Units (NTU) shall not be: |                           |
| (A) Greater than 1 NTU                                                     | AA and A                  |
| (B) Greater than 2 NTU                                                     | B                         |
| (C) Greater than 5% above natural conditions                               | 1                         |
| (D) Greater than 10% above                                                 | 2                         |

natural conditions

(Effective May 26, 1996)

**2401-11-17 Radioactive Materials**

| <u>STANDARD</u>                                                                                                                                                                                                                                                  | <u>APPLICABLE CLASSES</u> |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| (A) The concentration of radioactive materials in water shall not exceed 1/30th of the maximum permissible limits established for continuous occupational exposure given in the latest edition of the <i>U.S. National Bureau of Standards Handbook No. 69</i> . | All Waters                |
| (B) No radionuclides shall be present in amounts that would exceed the maximum permissible levels established in the Republic of Palau Public Water Supply Regulations.                                                                                          | All Waters                |
| (C) The concentration of radioactive materials in water shall not result in the accumulation of radioactivity in plants or animals that would result in a hazard to humans or aquatic life.                                                                      | All Waters                |

(Effective May 26, 1996)

**2401-11-18 Oil and Petroleum Products**

| <u>STANDARD</u>                                                                                                                            | <u>APPLICABLE CLASSES</u> |
|--------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| The concentration of oil and petroleum products shall not:                                                                                 |                           |
| (A) Be detectable as a visible film sheen or discoloration of the surface or cause an objectionable odor.                                  | All Waters                |
| (B) Cause tainting of fish or other aquatic life, be injurious to the indigenous biota, or cause an objectionable taste in drinking water. | All Waters                |
| (C) Form an oil deposit on beaches or shorelines or on the bottom of a body of water.                                                      | All Waters                |

(Effective May 26, 1996)

**2401-11-19 Toxic Substances**

Marine and fresh water standards for toxic substances are set forth in Appendix A to the these Marine and Fresh Water Quality Regulations. The Board may amend Appendix A from time to time to add additional substances or modify the standards for particular substances as the Board deems appropriate.

(Effective May 26, 1996)

**2401-11-20 General Conditions**

(A) All methods of sample collection, preservation, and analysis used to determine compliance with these standards shall be in accordance with those specified in the latest edition of *Standard Methods for the Examination of Water and Wastewater*, by the American Public Health Association or methods specified by the United States Environmental Protection Agency in 40 CFR Section 136 *et seq.*, as appropriate. Samples should be collected at approximately equal intervals and under those conditions of tide, rainfall, and time of day when pollution is most likely to be the greatest or at a maximum level.

(B) Whenever water quality standards are exceeded, samples shall be taken at frequent intervals to be determined by the Board according to the severity of the violation.

(C) Whenever natural conditions are of a better quality than an assigned water quality criteria, the natural conditions shall constitute the water quality criteria. [See also: Sections 2401-11-03(E) and 2401-11-09(B)(6)].

(D) Whenever two numeric criteria are in conflict, the more stringent criteria shall constitute the water quality criteria.

(E) Pollutant discharge to either surface or ground waters shall be controlled so as to protect not only the receiving water but also those waters into which the receiving waters may flow.

(Effective May 26, 1996)

**IMPLEMENTATION MEASURES****2401-11-21 Approval Required for New or Increased Pollutants**

(A) It shall be a violation of these regulations for any person to initiate any project which may represent a new or increased source of pollution, either point source or non-point source, without first obtaining written approval of the EQPB.

(B) It is incumbent upon the person initiating the project to demonstrate to the EQPB that the project will not directly or indirectly impair any beneficial uses of the affected waters.

(C) The EQPB may place conditions of the construction and/or operation of the project as necessary to mitigate or eliminate any adverse water quality impacts associated with the project.

(D) The EQPB may withhold approval for any project until the project has received all necessary permits and clearances or has demonstrated that such clearances will be obtained at the appropriate time.

(Effective May 26, 1996)

**2401-11-22 Discharge Permit Required**

Any point source of discharge shall be in violation of these regulations unless the discharge operator has received a Pollutant Discharge Permit from the EQPB.

(Effective May 26, 1996)

**2401-11-23 Written Approval for Hazardous Substances**

It shall be in violation of these regulations for any person to store, dispose of or allow to accumulate any hazardous substance in such a manner that the substance may enter the surface or ground waters of the Republic of Palau without first obtaining written approval of the EQPB. Such substances include, but are not limited to petroleum products, pesticides, radioactive substances, and toxic chemicals. The EQPB may require persons handling hazardous substances to implement measures to reduce the possibility of contaminating the surface or ground waters of the Republic of Palau.

(Effective May 26, 1996)

**2401-11-24 Response to Spills**

(A) In the event of an accidental spill or discharge of hazardous substances, the responsible person shall immediately notify the EQPB and take all reasonable measures to contain the material so that it will not contaminate the surface or ground waters of the Republic of Palau.

(B) Failure to notify the EQPB within 24 hours and take reasonable mitigation measures shall also constitute a violation of these regulations.

(Effective May 26, 1996)

**TRANSITION UNDER COMPACT****2401-11-25 Definitions**

Unless specifically indicated otherwise, or unless the context clearly requires a different meaning, for the purposes of Sections 2401-11-25 through 2401-11-29, inclusive:

(A) "NPDES Permit" means any USEPA National Pollutant Discharge Elimination System Permit issued by the USEPA under the authority of the U.S. Federal Water Pollution Control Act Amendments of 1972, 82 Stat. 886, 33 U.S.C. 1251, *et seq.*, as amended by the Clean Water Act of 1977, 91 Stat. 1566, 33 U.S.C. 1251, *et seq.*, and the Water Quality Act of 1987, 101 Stat. 7, 33 U.S.C. 1251, *et seq.*

(B) "USEPA" means the United States Environmental Protection Agency.

(Effective May 26, 1996)

**2401-11-26 Continuation of NPDES Permits**

(A) All NPDES Permits, and the terms and conditions thereof, in effect on September 29, 1994 for

discharges within the territory of the Republic of Palau shall continue in effect after the implementation of the Compact of Free Association between the Republic of Palau and the United States of America and are hereby adopted as EQPB Pollutant Discharge Permits.

(B) All holders of NPDES Permits and those that discharge pollutants, whether directly or indirectly, whether from point-sources or non-point-sources must continue to abide by the terms and conditions of the NPDES permits (as adopted as EQPB Pollutant Discharge Permits) until they are replaced by a subsequent EQPB Pollutant Discharge Permit.

(Effective May 26, 1996)

#### **2401-11-27 Palau Discharge Permit Application Required**

All holders of NPDES Permits and those that discharge pollutants, whether directly or indirectly, whether from point-sources or non-point-sources shall, within 90 days of the implementation of the Compact of Free Association, apply to the EQPB for a new or revised Pollutant Discharge Permit.

(Effective May 26, 1996)

#### **2401-11-28 Continuation of Permitted Conduct**

During the time period when such a permit application is pending before the EQPB, the discharges authorized by the NPDES Permit (as adopted as an EQPB Pollutant Discharge Permit) may continue, notwithstanding any expiration date on the permit. Once, however, the EQPB issues a new Pollutant Discharge Permit as a result of the application required by Section 2401-11-27, all authorizations to discharge pollutants under the NPDES Permit (as adopted as an EQPB Pollutant Discharge Permit) shall cease.

(Effective May 26, 1996)

#### **2401-11-29 Compliance With Law Required**

Nothing in these regulations shall be construed to allow any person to avoid the requirements of the Environmental Quality Protection Act, and the Regulations promulgated thereunder, including but not limited to the Sections 2401-11-21 and 2401-11-22 of the Marine and Fresh Water Quality Regulations requirement that prior written authorization and appropriate permits be obtained from the EQPB prior to the initiation of any project that may represent a new or increased source of either point-source or non-point source pollution.

(Effective May 26, 1996)

### **MIXING ZONES**

#### **2401-11-30 Applicability and Limits**

(A) The water quality standards and criteria set forth in Sections 2401-11-9 through 2401-11-19 may apply within a mixing zone unless specific alternative criteria have been approved by the Board.

(B) Mixing zones will not be granted in lieu of reasonable control measures to reduce point source pollutant discharges but will be granted to compliment the applicable controls.

(Effective May 26, 1996)

#### **2401-11-31 Permit Required**

(A) All new point source discharges beginning after December 1, 1990 shall apply for an EQPB Pollutant Discharge Permit. This permit shall be required even if it can be demonstrated that the discharge will meet the applicable water quality standards at the point of discharge.

(B) It shall be a violation of these regulations for any person to commence discharging from a new point or non-point source without first obtaining all required permits.

(Effective May 26, 1996)

(C) *All point and non-point discharges subject to the provisions of this Chapter shall comply with the terms, conditions, provisions and management plans for any National, State or traditional conservation area, preserve or other protected area as established by law.\**

*\*(Amendment Effective March 12, 1999)*

#### **2401-11-32 Mixing Zone Application**

(A) Any application for a zone of mixing must contain the following:

(1) Evidence that the EQPB Pollutant Discharge Permit has been applied for and will be obtained;

(2) A description of the waste to be discharged including flow rate and pollutant types and quantities;

(3) The location of the discharge and a description of the disposal methods (e.g. outfall size, number and type of diffusers, etc.);

(4) Evidence that the concentration of toxic substances present in the discharge will not violate water quality standards for toxic substances;

(5) Identification of those substances for which the mixing zone is required;

(6) A certification for each substance identified in these regulations that after initial mixing the concentration of the substance will not exceed the applicable water quality standard. The following equation shall be used to calculate concentration after initial dilution:

$$C_f = \frac{C_c + C_b (D_x)}{(D_x + 1)}$$

$C_f$  = Concentration after mixing  
 $C_c$  = Effluent concentration (instantaneous maximum)  
 $C_b$  = Background concentration  
 $D_x$  = Dilution ration

(7) Evidence that the basic water quality standards (Section 2401-11-9 through 2401-11-19, inclusive) will not be violated within the mixing zone;

(8) A proposed schedule of effluent and receiving water monitoring to determine compliance with the proposed mixing zone;

(9) A technical justification why a mixing zone should be permitted; and,

(10) Any other information required by the Board.

(B) The mixing zone shall be defined under those conditions of tide, wind, runoff, density stratification and discharge that would result in the minimum dilution.

(Effective May 26, 1996)

#### **2401-11-33 Existing Discharges**

All existing point source discharges must apply to the Board for a mixing zone or demonstrate that one is not required not later than June 1, 1992. The application procedure is identical to the one for new sources.

(Effective May 26, 1996)

#### **2401-11-34 False or Misleading Information Prohibited**

It shall be in violation of these standards for any person to knowingly present false or misleading information to the Board in an application for a mixing zone.

(Effective May 26, 1996)

#### **2401-11-35 Mixing Zone Application Review**

(A) In reviewing a mixing zone application the Board will consider:

(1) Present and anticipated uses of the water body.

(2) Whether an adequate zone of passage will exist for the movement of aquatic life.

(3) The proximity of other mixing zones.

(4) Whether the granting of a mixing zone is in the public interest.

(B) The Board may request additional information from the applicant that is deemed relevant to the Board's determination.

(Effective May 26, 1996)

#### **2401-11-36 Mixing Zone Certification Determination**

(A) The Board may either approve, conditionally approve or disapprove a mixing zone application after conducting a public hearing on the application. The Board will notify the applicant in writing of its determination. The notification will include, but is not limited to:

(1) The duration of the mixing zone; and,

(2) Any conditions placed upon the Board's approval of the application. Conditions may include, but are not limited to:

(a) Effluent and receiving water monitoring and reporting requirements;

(b) A timetable for the reduction or elimination of the discharge; and,

(c) The parameters for which the mixing zone is being granted and the alternative criteria that will apply within the mixing zone.

(B) If the Board disapproves a mixing zone application, it will notify the applicant, in writing, of the reasons for the disapproval.

(Effective May 26, 1996)

### **MARINE SANITATION DEVICES**

#### **2401-11-37 Definitions**

Unless specifically indicated otherwise, or unless the context clearly requires a different meaning, for the purposes of Sections 2401-11-37 and 2401-11-38:

(A) "Discharge" includes, but is not limited to, any spilling, leaking, pumping, pouring, emitting, emptying, or dumping.

(B) "Federal Water Pollution Control Act" means the U.S. Federal Water Pollution Control Act Amendments of 1972, 82 Stat. 886, 33 U.S.C. 1251, *et seq.*, as amended by the Clean Water Act of 1977, 91 Stat. 1566, 33 U.S.C. 1251, *et seq.*, and the Water Quality Act of 1987, 101 Stat. 7, 33 U.S.C. 1251, *et seq.*

(C) "Marine Sanitation Device" includes any equipment for installation on board a vessel and which is designed to receive, retain, treat, or discharge sewage and any process to treat such sewage.

(D) "Sewage" means human body wastes and the wastes from toilets and other receptacles intended to receive or retain body wastes.

(E) "Vessel" includes every description of watercraft or other artificial contrivance used, or capable of being used, as a means of transportation on any waters of or within the Republic of Palau.

(F) Other terms shall have the Definitions set forth in 40 CFR Section 140.1 and 33 CFR Section 159.3

(Effective May 26, 1996)

#### **2401-11-38 Marine Sanitation Device Requirements**

All Marine Sanitation Device requirements in effect within the Republic of Palau on September 29, 1994, as set forth in 33 CFR Part 159 and 40 CFR Part 140 shall continue in effect after the implementation of the Compact of Free Association between the Republic of Palau and the United States of America and are hereby adopted by reference and no discharge of sewage pertaining to vessels shall occur within the Republic of Palau in violation of said Marine Sanitation Device Requirements.

(Effective May 26, 1996)



**SPILL PREVENTION CONTROL AND  
COUNTERMEASURES (SPCC)**

**2401-11-39 Applicability**

Sections 2401-11-39 through 2401-11-41 apply but are not limited to all facilities that, on September 29, 1994, were subject to the SPCC requirements of USEPA. This includes, but is not limited to all bulk petroleum product storage facilities within the Republic of Palau.

(Effective May 26, 1996)

**2401-11-40 Definitions**

Unless specifically indicated otherwise, or unless the context clearly requires a different meaning, for the purposes of this Section,

(A) "Owner or Operator" means any person owning or operating an on-shore facility or an off-shore facility, and, in the case of an abandoned facility, any person that owned or operated the facility immediately prior to abandonment.

(B) "SPCC Plan" means the Spill Prevention Control and Countermeasure Plan required pursuant to 40 CFR Part 112.

(Effective May 26, 1996)

**2401-11-41 SPCC Requirements**

(A) The SPCC Plan and oil spill requirements of 40 CFR Parts 110, 111 and 112 are hereby adopted by reference, except that the Board shall have the authority to take any action or impose any requirement that said Parts of the CFR authorize the Administrator to take or impose.

(B) Any person that owns or operates any facility, whether off-shore or on-shore, shall complete, maintain, and, as either necessary or as required by the EQPB, revise the SPCC plan for that facility to the same extent required by 40 CFR Parts 110, 111 and 112.

(Effective May 26, 1996)

**WATER USE AREAS:  
CLASSIFICATION AND ESTABLISHMENT**

**2401-11-42 Surface Waters**

The following classification of water uses shall apply to the following areas:

(A) Babeldaob

(1) Class AA: All areas not otherwise classified and those coastal waters not having a specific water use classification are considered Class AA Waters.

(2) Class B: Village Docks

(B) Koror

(1) Class AA: All areas (not otherwise classified)

- (2) Class A:
- (a) Meyuns
- (b) Echang
- (c) Cholebdechal (Oleblechol)
- (d) Ngiritang
- (e) M-Dock (Singhatoba) Point
- (f) Ngetmeduch
- (g) Mechang
- (3) Class B:
- (a) Malakal (Ngemelachel) Harbor
- (b) M-Dock (Singhatoba) including S.E. of Ngerbeched Shore
- (c) Kemangel Toachel, excluding T-Dock (Ngerkemais)
- (d) Metukerademul to E. side of old Japanese Dock (Derromel)
- (e) Ngereksong
- (f) *Nikko (Iwayama) Bay from the Nikko pier to a shoreline boundary approximately 1200 feet N.W. of the Nikko pier and an additional 300 feet of offshore reef flat to the N.W. of the shoreline boundary.\**
- (g) *Waters extending 200 meters from the shoreline of Ngerur Island.\*\**
- (C) Peleliu
- (1) Class AA: All areas (not otherwise classified)
- (2) Class A:
- (a) Ngebad to Ngarekeiukel point
- (b) Southern side of island
- (3) Class B: Akalakul (Elochel) Dock
- (D) Angaur
- (1) Class AA: All areas (not otherwise classified)
- (2) Class A:
- (a) Pkulamekaep (Bkulamekaeb) point to Medorm Beach south of Pkulagelul (Bkulengeluul) point
- (b) Beach between Ngedeloch point and Medorm
- (3) Class B: Angaur (Ngeaur) Harbor
- (E) Sonsorol
- Class AA: All areas (not otherwise classified)
- (F) Tobi
- Class AA: All areas (not otherwise classified)
- (G) Merir
- Class AA: All areas (not otherwise classified)
- (H) Pulo Anna
- Class AA: All areas (not otherwise classified)

(Effective May 26, 1996)

\**(Amendment Effective May 18, 1998)*

\*\**(Amendment Effective October 6, 2000)*

**2401-11-43 Groundwater Areas**

The following classification of water uses shall apply to the following areas:

(A) Class I Groundwater: All sources of fresh groundwater on all islands, whether publicly or privately owned, used or potentially used, for domestic, culinary or food processing purposes.

(B) Class II Groundwater: All fresh groundwater not included in Class I and Class III.

(C) Class III Groundwater: All groundwater not considered potential sources of drinking water and of limited beneficial use which are heavily saline, with total dissolved solids levels over 10,000 mg/l or which are

otherwise contaminated beyond levels that allow cleanup using methods reasonably employed in public water system treatment.  
(Effective May 26, 1996)

certification and/or permit for which certification is sought.  
(Effective May 26, 1996)

## **WATER QUALITY CERTIFICATION**

### **2401-11-44 Permits/Licenses Subject to Certification**

(A) Water quality certification must be provided by the Board prior to the issuance of any EQPB Permits or any permits required by Sections 402 and 404 of the United States Clean Water Act (33 U.S.C. Sections 1342 and 1344) and section 10 of the United States Rivers and Harbors Act, approved March 3, 1899, (33 U.S.C. 403).

(B) A Republic of Palau Foreign Investment Board license may also be required in order to receive water quality certification.

(Effective May 26, 1996)

### **2401-11-45 Scope of Work**

The scope of review of applications for certification shall be sufficient to determine that no permit would violate water quality standards or become a source of pollution in the future. Such review shall include an examination of but not limited to the following:

(A) Impact on water quality at the proposed project site;

(B) Impacts on water quality of any or all waters influenced by the project, including groundwater, downstream and upstream waters, tidal influenced water or other fresh, marine, or brackish water influenced by the project as a result of topography, percolation, recharge, currents or other hydrologic and geologic conditions;

(C) Impacts of operation of the project on water quality at site and influenced waters as described in Division B; and

(D) All criteria and standards included in these regulations shall be considered.

(Effective May 26, 1996)

### **2401-11-46 Approval Criteria**

(A) No certification shall be issued in violation of the national policy set forth in Section 2401-11-03 of these regulations.

(B) Certification of projects which are not water dependent shall be denied.

(C) Certification of non-water dependent projects for which there is a viable alternative shall be denied.

(D) Certification is denied if the project will prevent or interfere in the maintenance of applicable water quality standards.

(E) Certification is denied if impacts to water quality can not be made acceptable through conditioning of the

### **2401-11-47 Conditioning of the Certification**

(A) The Board shall place any conditions on a water quality certification that are necessary to assure the applicant will comply with water quality standards, effluent limitations, and with any applicable Republic of Palau or its State's Laws or Regulations.

(B) Conditions shall include, but are not limited to:

(1) structural and nonstructural mitigation measures;

(2) appropriate effluent treatment systems;

(3) appropriate operations and maintenance plans;

(4) compensation to the fullest extent possible for functional losses to the local ecosystem by the unavoidably lost wetlands; and,

(5) compensation for the loss of certain areas with the permanent preservation of other similar ecosystems.

(Effective May 26, 1996)

### **2401-11-48 Contents of Certification**

A certification made by the Board shall include the following:

(A) The name and address of the applicant;

(B) A statement that the Chairman has either:

(1) Examined the application made by the applicant to the licensing or permitting agency (specifically identifying the number or code affixed to such application) and bases the certification upon an evaluation of the information contained in such application which is relevant to water quality considerations; or,

(2) Examined other information furnished by the applicant sufficient to permit the Chairman to make the statement described in Subdivision 1 above;

(C) A statement that there is a reasonable assurance that the activity will be conducted in a manner which will not violate applicable water quality standards;

(D) A statement of any conditions which the Chairman deems necessary or desirable with respect to the discharge of the activity; and,

(E) Such other information as the Chairman may determine to be appropriate.

(Effective May 26, 1996)

### **2401-11-49 Standard For Certification**

If, after considering the complete application, comments received during the public comment period, the record of any public hearing held pursuant to 24 PNC Section 162 and other information and data as the Chairman deems relevant, should the Chairman determine that there is a reasonable assurance that applicable water quality standards will not be violated and the best practicable methods of control will be

applied to a discharge which is the result of any activity including, but not limited to, the construction and operation of facilities, then the Chairman shall so certify.

(Effective May 26, 1996)

#### **2401-11-50 Certification Modification**

The Chairman may modify the certification prior to the issuance of any applicable license or permit, after consideration of information presented by the applicant, licensing or permitting agency or other government agencies or interested parties.

(Effective May 26, 1996)

#### **2401-11-51 Contents of Application**

(A) An applicant for certification shall submit a complete description of the discharge involved in the activity for which certification is sought, with a request for certification signed by the applicant. Such description shall include the following:

- (1) The name and address of the applicant;
- (2) A description of the facility or activity, and of any discharge into the Republic of Palau waters which may result from the conduct of any activity including, but not limited to the construction or operation of the facility, including characteristics of the discharge, and the location or locations at which such discharge may enter waters of the Republic;
- (3) If applicable, a description of the function and operation of equipment or facilities to control discharges, including specification of the methods of control to be used;
- (4) The estimated date or dates on which the activity will begin and end the date or dates on which the discharge(s) will take place;
- (5) If applicable, a description of the methods and means being used or proposed to monitor the quality and characteristics of the discharge and the operation of equipment or facilities employed in the control of the proposed discharges;

(B) The Chairman may require the submission of additional information after a certification application has been filed, and shall insure that, if the certification application is incomplete or otherwise deficient, processing of the application shall not be completed until such time as the applicant has supplied the missing information or otherwise corrected the deficiency. The Chairman shall notify the applicant, in writing, within thirty (30) days of the submission of an application, if an application is incomplete or otherwise deficient. A description of the type of additional information necessary to complete the application or correct the deficiency will be included with such a written notice. Failure to provide additional information or to correct a deficiency shall be sufficient grounds for denial of certification.

(C) The applicant will be informed, in writing, by the Chairman, when a certification application is considered to be complete. The Chairman shall act on a request for certification within a period which shall not exceed three (3) months;

(D) The applicant is required to notify the Board immediately, in writing, of changes which may effect the application and certification process:

(E) Fees shall be made payable to the National Treasury. The Republic and its State governments and agencies are exempt from paying filing fees.

(Effective May 26, 1996)

#### **2401-11-52 Notice and Hearing**

(A) The Chairman may, upon request, provide the opportunity for a public hearing(s) to consider the issuance of a water quality certification. A notice shall be published in accordance with 24 PNC Section 162.

(B) The Chairman shall inform the applicant, in writing, that such action has been taken.

(C) All publication costs related to public hearing(s) notification(s) shall be paid by the applicant to the necessary and appropriate newspaper agency(ies) prior to publication date. Failure to do so may result in a delay in the certification process beyond three (3) months.

(Effective May 26, 1996)

#### **2401-11-53 Waiver**

If the discharge in question is the result of activities which receive a nationwide permit for the discharge of dredge and fill materials, thereby fulfilling specific conditions of that permit pursuant to 24 PNC Section 162, then the Chairman will determine, on a case-by-case basis, which projects are considered to be minor, with a negligible impact and non-controversial. Certification requirements of this section shall be waived for minor projects which have a negligible impact, and are non-controversial activities within three (3) months of the receipt of a completed application.

(Effective May 26, 1996)

#### **2401-11-54 Effect of New Standards on Permitted Activity**

The Board shall review any project or activity wherever:

(A) A license or permit was issued without certification due to the absence of applicable water quality standards;

(B) Water quality standards applicable to the waters into which the licensed or permitted activity may discharge are subsequently established before the activity is completed; and,

(C) The Board determines that such uncertified activity is violating water quality standards.

(Effective May 26, 1996)

### **ENFORCEMENT**

#### **2401-11-55 Enforcement**

Any person in violation of any of the provisions of these regulations shall be subject to enforcement and court action under 24 PNC Sections 161 through 172, inclusive.

(Effective May 26, 1996)

**MISCELLANEOUS PROVISIONS**

**2401-11-56 Severability Clause**

If any provisions of these regulations or the application of any provision of these regulations to any person or circumstances is held invalid, the application of such provision to other persons or circumstances and the remainder of these regulations shall not be effected thereby.

(Effective May 26, 1996)

**2401-11-57 Repealer**

The regulations contained herein shall replace the Republic of Palau EQPB Marine and Fresh Water Quality Standards Regulations in effect upon the effective date of these regulations.

(Effective May 26, 1996)

**2401-11-58 Protected Areas**

*All activities subject to the provisions of this Chapter shall comply with the terms, conditions, provisions and management plans for any National, State or traditional conservation area, preserve or other protected area as established by law.\**

*\*(Amendment Effective March 12, 1999)*

**AMENDMENT TO REPUBLIC OF PALAU MARINE AND FRESHWATER  
QUALITY REGULATIONS, CHAPTER 2401-11-05**

Chapter 2401-11-05 is amended by repealing and replacing (C) and adding a new (D) to read:

2401-11-05 Classification of Coastal Water Uses

(C) Class B Waters

(1) The uses to be protected in this class of waters are small boat harbors, commercial and industrial shipping, bait fishing, compatible recreation, over-water commercial or residential structures for recreational or domestic use, resource extraction, the support and propagation of aquatic life, and aesthetic enjoyment.

(2) It is the objective for this class of waters that discharge of any pollutant be controlled to the maximum extent possible and that sewage and industrial effluent receive the highest degree of treatment practicable under existing technological and economic conditions, and shall be compatible with the standards established for this class.

(3) The Class B designation should apply only to a limited area next to boat docking facilities. No new coastal areas with a coastal mangrove fringe greater than 50 feet in width shall be classified as class B waters after May 18, 1998.

(4) Unless the boundaries of a Class B area are specifically identified, the area is limited to those waters within 1000 feet of a boat docking facility. The rest of the water area in such bay or harbor not falling within the area identified above shall be Class A unless given some other specific designation.

(D) Class BB Waters

(1) The uses to be protected in this class of waters are sand mining, compatible recreation, the support and propagation of aquatic life, and aesthetic enjoyment.

(2) It is the objective of this class of waters that sand mining be allowed but in such a manner and at such times as to minimize impacts on other uses. Discharges of sediment associated with sand mining shall be controlled to the greatest extent practicable under existing technological and economic conditions, and any live or intact coral within the area shall not be disturbed.

(3) The Class BB designation shall apply only to clearly identified and delineated areas and shall be limited to areas that contain little or no coral and which have not been identified as providing important habitat for the support and propagation of aquatic life.

(4) A baseline study, as required under Chapter 2401-1-07 shall be conducted and provided to the Board before the Board will designate an area as Class BB.

Effective Date: 4/12/2002

Certification of Adoption: 

Paula R. Holm, Chairperson  
Environmental Quality Protection Board

**AMENDMENT TO THE REPUBLIC OF PALAU MARINE AND FRESH  
WATER QUALITY REGULATIONS**

Pursuant to 24 PNC § 129, and having met the requirements of the Administrative Procedure Act, 6 PNC § 101 et seq., the Environmental Quality Protection Board hereby amends the Marine and Fresh Water Quality Regulations, Water Use Areas: Classification and Establishment, Chapter 2401-11-42 Surface Waters at (B)(3) to add (h) Bkul Echol as follows:

WATER USE AREAS: CLASSIFICATION AND ESTABLISHMENT

2401-11-42 Surface Waters

The following classification of water uses shall apply to the following areas:

- |                |       |
|----------------|-------|
|                | * * * |
| (B) Koror      | * * * |
| (3) Class B    | * * * |
| (h) Bkul Echol |       |

**An area of approximately 17,050 square meters starting from the corner boundary between Cadastral Lot No. 025 A 02 and Cadastral Lot No. 025 A 04 and then proceeding west one hundred and ten (110) meters to the eastern boundary of Cadastral Lot No. 25-A-01 (Ngeriungs Island) and then proceeding in a northerly direction parallel to the western boundaries of Cadastral Lot Nos. 025 A 04, 025 A 05, 024 A 04, and 024 A 03 for one-hundred and seventy-five (175) meters and then east to the shoreline.**

Certification  
Of Adoption:



\_\_\_\_\_  
Earnest Ongidobel, Vice Chairman  
Environmental Quality Protection Board

Adoption Date:

9/17/09

Presidential  
Approval:



\_\_\_\_\_  
His Excellency Johnson Toribiong, President  
Republic of Palau

Approval Date:

9/22/09

**PORT RULES AND REGULATIONS  
DIVISION OF TRANSPORTATION  
Bureau of Commercial Development  
Ministry of Commerce & Trade  
Republic of Palau**

AUTHORITY

THE PORT RULES AND REGULATIONS FOR THE REPUBLIC OF PALAU ARE PROMULGATED AND ISSUED PURSUANT TO THE AUTHORITY GRANTED BY LETTER OF DELEGATION OF AUTHORITY DATED SEPTEMBER 24,1980, IN WHICH THE AUTHORITY TO ESTABLISH HARBOR RULES AND REGULATIONS WAS TRANSFERRED BY THE HIGH COMMISSIONER OF THE TRUST TERRITORY OF THE PACIFIC ISLANDS TO THE REPUBLIC OF PALAU.

FOR THE CONVENIENCE OF ALL PARTIES LEGITIMATELY INTERESTED, COPIES OF THE PORT RULES AND REGULATIONS OF THE REPUBLIC OF PALAU MAY BE OBTAINED AT THE DIVISION OF TRANSPORTATION, AND IT IS SUGGESTED THAT ALL SUCH PARTIES SECURE COPIES FOR THEIR INFORMATION AND GUIDANCE.

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- 

[Header A: **PORT RULES AND REGULATIONS**]

**Section 1. Definitions**

1-1 BERTH: A vessel which is moored or made fast to a dock, wharf, dolphin or other structure is said to occupy a berth.

1-2 CARGO: shall mean all goods, wares, material, freight and merchandise.

1-3 CARGO STORAGE CHARGE or terminal storage is a charge assessed for assigned space occupied by cargo at a wharf.

1-4 COMMERCIAL PORT is a port designed for trade and other commercial activity which means Malakal, Koror and such other port as may be designated by the President or designee from time to time.

1-5 DEMURRAGE is a charge assessed for unassigned space occupied by cargo at a wharf after the expiration of free time.

1-6 DOCKAGE is the charge assessed against a vessel when:

- (a) The vessel is berthed at or made fast to a dock, wharf, dolphin, or other structure.
- (b) The vessel is lying alongside of or tied up to another vessel which is berthed at or made fast to a dock, wharf, dolphin or other structure, or
- (c) The vessel is not tied up to or lying alongside of but is using a dock or wharf by means of boats, rafts, lighters or otherwise.

1-7 FREE TIME is that period of time allowed for cargo to remain at a wharf for purposes of (1) assembling and loading the same and enabling its receipt at a wharf, without assessment of Demurrage or Cargo Storage Charges.

1-8 INFLAMMABLE LIQUID is any liquid which gives off inflammable vapors at or below a temperature of 80 F as determined by the use of a Tagliabue Open Cup Tester.

1-9 INTER-ISLAND OR INTRA-ISLAND FREIGHT is that freight or cargo handled between wharfs, piers or docks in the islands of Palau.

1-10 OUTSIDE BERTH: A vessel which is moored or made fast to another vessel which is occupying a berth is said to occupy an outside berth.

1-11 OVERSEA FREIGHT is that cargo coming from or going to any foreign port.

1-12 PILOT shall mean a person who is employed by the Republic of Palau, holds a valid Pilot's license to operate within the waters of Palau, and provides pilotage service as part of his employment.

1-13 PILOTAGE is a charge assessed against a vessel for pilotage service into or out of a port or harbor.

1-14 PORT ENTRY FEE is a charge assessed against a vessel engaged in foreign trade for entry into a port or harbor.

1-15 RENTALS are transactions by which space is provided for all purposes other than the storage of cargo or dockage including office space, parking space or lockers.

1-16 RULES AND REGULATIONS are these rules as promulgated and as they may be amended from time to time.

1-17 TON, when used with respect to the computation of wharfage or demurrage, means:



- (a) By weight, 2,000 pounds.
- (b) By volume, 40 cubic feet.
- (c) By Board-foot measurement in the case of lumber, 480 Board-feet.

1-18 TRANSIT FREIGHT is cargo transit from an Overseas port, traveling between ports in the Republic of Palau without intermediate off-loading to a wharf of a Republic of Palau port.

1-19 ROP shall mean the Republic of Palau.

1-20 VESSEL embraces power boats, ships, tugs, sailing vessel barges, outrigger canoes, scow, lighters, ferry boats, pleasure craft, floating equipment, house boats, floating gear and any and all other water craft capable of being used as a means of transportation.

1-21 WHARF, PIER, DOCK or TERMINAL AREA is any area set aside and devoted to the receiving and discharging of cargo or passengers from or onto ocean vessels.

1-22 WHARFAGE is a charge assessed against cargo when the cargo is:

- (a) Passing or conveyed over, onto or under any wharf, or
- (b) Passing or conveyed to or from a vessel while such vessel is:
  - (1) Made fast to a wharf, or
  - (2) Moored in any slip, channel, basin or canal or
  - (3) Made fast to another vessel which is made fast to a wharf or moored in any slip, channel basin or canal.

Wharfage is charged solely for the use of the wharf, slip, channel, basin or canal and does not include charges for any other activity or service.

## **Section 2. Regulations - General**

### **2-1 DELEGATION OF AUTHORITY**

The Chief, Division of Transportation and the Port Manager are hereby designated the Representative of the Minister of Commerce & Trade and are thereby delegated the authority to administer these Rules and Regulations and to establish any necessary procedures for the efficient and safe operation of the ports and harbors Under their Jurisdiction.

### **2-2 SPECIFIC AUTHORITY OF PORT MANAGER**

- (a) A master or person in charge of a vessel shall obey and carry into effect any orders given by the Port Manager regarding the manner of bringing vessels to anchorage, entering or leaving a harbor, or coming alongside of or leaving any wharf and shall not move or allow his vessel to be moved in, out, or within a harbor, or anchorage without the permission of the Port Director.
- (b) The berthing of vessels wharves shall be at the discretion of the Port Manager.
- (c) No person without the consent of the Port Manager shall cut or cast off any mooring line, rope or tackle made fast or attached to any vessel, wharf, mooring, buoy or other structure.

## 2-3 DUTY OF MASTER AND CREW TO GIVE AID AND ASSISTANCE

- (a) The master and crew of every vessel shall, when requested, give the Port Manager all possible aid in the performance of his duties in relation to such vessel.
- (b) If there is no person aboard a vessel with proper authority or if there is an insufficient number of persons aboard such vessel or if the master or crew refuse to aid the Port Manager in moving, pumping, mooring or unmooring of such a vessel when directed to do so by the Port Manager, then the Port Manager is authorized and empowered to move, pump, moor or unmoor such vessel, to this end the Port Manager may, if necessary, hire such assistance, equipment, and tackle or purchase and put aboard such ballast as to him seems requisite. All at the expense of the master, owners and agents of such vessel, which costs shall be paid before permission for departure is given. The government, its employees and agents shall not be liable for any damage or loss occurring to any vessel in consequence of such proceedings.

## 2-4 CONSENT TO RULES AND REGULATIONS

The use of the waterways and facilities of Palau shall constitute a consent to the terms and conditions of these Rules and Regulations and an agreement on the part of the vessel, its master, crew, owners and agents to pay all charges specified and to be governed by these Rules and Regulations.

## 2-5 DEPOSIT

The master, owner, or agents of a vessel arriving at a harbor at which a Port Manager is stationed shall deposit with the District Transportation Director in cash, or other legal tender, funds in an amount as determined by the Director, Bureau of Commercial Development cover all proposed obligations under these Rules and Regulations. Such a deposit will become unnecessary if credit is established with the Director, Bureau of Commercial Development.

## 2-6 RESPONSIBILITY OF AGENT FOR FEES

If any agent or character purports to act as agent for a vessel by telephoning or otherwise communicating with the Director, Bureau of Commercial Development on behalf of a vessel; he thereby assumes credit responsibility for that vessel and any vessel she may have in tow unless, prior to arrival of that vessel he notifies the Director, Bureau of commercial Development in writing, of his non-responsibility.

## 2-7 DAMAGES TO WHARF OR WHARF STRUCTURES

The master, owner, or agents requesting a berth, cargo space allocation, or use of harbor facilities incident to the receiving, discharging, loading or removal of cargo, will be liable for all damage caused to any property during such use of harbor facilities.

## 2-8 LIABILITY

All vessels, their masters, owners and agents shall indemnify and save harmless the government, its officers, agents and employees, from and against all losses, claims, demands, and suits for damages, including death and personal injury, together with Court costs and Attorney's fees, incident to or resulting from their operations within a port, wharf or harbor of Palau.

## 2-9 INSPECTION

The Port Manager or his designee shall be permitted access to enter upon and inspect any vessel to ascertain the kind quality and quantity of cargo thereon, and upon any rented or leased premises of the government to inspect the same.

## 2-10 PENALTY

The violation of these Rules and Regulations or of any written procedures adopted pursuant to these Rules and Regulations shall be a misdemeanor and shall be punishable by a fine in the sum of not more than One Thousand Dollars or not more than a year in jail or both.

## **Section 3. Regulations - /Waterways**

### 3-1 OPERATING PROCEDURES

- (a) Vessels more than 65 feet in length or exceeding 200 gross tons will advise the Port Manager of all moves into, within, or departing the harbor giving destinations.
- (b) No vessel shall anchor in any fairway of any channel or so as to Obstruct the approach to any wharf.
- (c) All vessels over 65 feet shall proceed at a rate of speed commensurate with safe navigation and slow enough so as not to cause damage to other vessels or property. Vessels under 65 feet shall proceed at a rate of speed not to exceed 10 nautical miles per hour.
- (d) No vessel solely under the power of sail shall enter the harbor unless equipped with an auxiliary engine in working order or accompanied by a power boat equipped to take it under tow in case of an emergency.
- (e) Except for those vessels entering the harbor for special repairs requiring minimum drafts all vessels will be ballasted so as to reduce freeboard to a reasonable degree.

### 3-2 PRIORITIES IN VESSEL MOVEMENTS AND BERTH ASSIGNMENTS

- (a) Priorities for vessel movements, other than for emergency, shall be as follows:
  - (1) Any vessel putting into port in a bona fide emergency status.
  - (2) Any vessel putting into port with cargo of immediate need and vital to community transportation, health or communication functions.
  - (3) Regularly scheduled cargo liner service vessels.
  - (4) Other regularly scheduled service vessels.
  - (5) Special charter vessels arriving at pre-arranged and pre-announced dates.
  - (6) Vessels owned by the ROP or U.S. Governments.
  - (7) All other vessels on a first-come, first-served basis.
- (b) Priorities for vessel movements in emergency situation shall be as follows:
  - (1) Vessels owned by the ROP & U.S. governments.
  - (2) Passenger vessels.
  - (3) Tankers
  - (4) Vessels with explosive cargo
  - (5) Freighters
  - (6) All other vessels on a first-come, first-served basis.
- (c) Agents shall submit the following to the Port Manager for scheduling:
  - (1) Submit vessel schedules as far in advance possible

- (2) Prior to 11:00 AM. Five days before vessel's arrival, or as soon thereafter as possible, submit estimated time of arrival. A berth assignment will be confirmed at this time.
- (3) Prior to 11:00 AM. Daily, submit known departures for the following day. A schedule shall be prepared at this time.
- (4) Prior to 11:00 AM. daily, submit known departures for the following day. A schedule shall be prepared at this time.
- (5) Any changes in times of arrival and departure occurring after the preparation of a schedule shall be reported to the Port Manager.
- (6) Berth assignments for a change in schedule will be made on a first-come, first-served and a not-to-interfere basis with the prepared schedule.
- (7) Application for berth assignments shall include any peculiar requirements for berthing and any physical features which would affect piloting or mooring.

### 3-3 PRIORITY OF SCHEDULED VESSELS

Vessels arriving or departing at the same hour will be granted priority as described in Section 3-2 (a) above, but within any category the vessel that was assigned a confirmed berth will be permitted to move first unless the vessel is late and operating conditions in the harbor dictate otherwise.

### 3-4 ARRIVAL WHEN PILOTAGE IS REQUIRED

Vessels requiring pilotage shall plan arrivals and departures for daylight hours.

### 3-5 DUTY OF AGENTS TO ARRANGE FOR LINEMAN

Agents shall arrange for proper and adequate lineman and insure that the same will be on time for all vessel arrivals, movements, or departures.

## **Section 4. Safety, Cleanliness and Use of Facilities**

### 4-1 ALARM

Five prolonged blasts of a whistle or siren is an alarm indicating a fire on board a vessel or at the dock at which a vessel is moored. Such a signal may be given and repeated at intervals to attract attention, but it is not a substitute for and shall be used in addition to other means of reporting a fire. Such a signal shall not be used for any other purpose. For the purpose of this section a "Prolonged Blast" shall mean a blast of four to six seconds in duration.

### 4-2 EXPLOSIVES

(a) No vessel containing more than five hundred pounds of Class A; one ton of Class B, or ten tons of Class C explosives (net explosive content) shall enter or be loaded in any harbor except on written permission of the Director, Bureau of Commercial Development and pursuant to the instructions of the Port Manager.

(b) All handling, loading, unloading or hauling, either away from or to a pier, of explosives shall be done in a safe and careful manner with the permission and pursuant to the instructions of the Port Director.

(c) No use of explosives shall be made within the harbor, on a wharf, or in the immediate vicinity of the same without the written permission of Director of Bureau of Commercial Development and the Port Manager.

#### 4-3 NITRATE OF SODA, NITRATE OF AMMONIA, SULPHUR OR OTHER SIMILAR MATERIAL

(a) During all time of loading and unloading of cargoes containing nitrate of soda, nitrate of ammonia, sulphur or other similar material the wharf must be kept clean and swept free of such materials and the master, owner or agent of the vessel must provide, at their expense, a container of not less than fifty gallons capacity filled with a solution of nitrate of soda and water at distances not more than fifty feet apart, with suitable buckets alongside each container, for the purpose of fighting any fire which may occur.

(b) If loose nitrate of soda, nitrate of ammonia, sulphur or other similar material is to be unloaded, it shall be placed directly into the carrier and immediately removed using such protective device approved by the Port Director and capable of preventing the material from falling upon the wharf.

(c) Nitrate of soda, nitrate of ammonia, sulphur or other similar material may be stored or left upon any wharf for a period of time not to exceed four hours, provided such material is packed in sound and non-leaking containers and the master, owner or agent of the vessel provide, at their expense, a competent watchman satisfactory to the Port Manager to give continuous care thereto.

#### 4-4 ACIDS

Sulphuric acid, muriatic acid, nitric acid and other similar material may not be stored or left upon any wharf for even a short period of time, but must be immediately removed from the wharf upon discharge and not put upon the wharf until the carrier is ready to receive the same in loading. Electric storage batteries are except from this provision if they are protected against short circuits and completely and securely boxed.

#### 4-5 INFLAMMABLE SUBSTANCES

(a) If inflammable substances are to be loaded or unloaded, and the same are not contained in sound and non-leaking containers, they shall be placed directly into the carrier and immediately removed from the wharf upon discharge and not put upon the wharf until the carrier is ready to receive the same in loading.

(b) No empty containers which have been used to hold inflammable substance shall be delivered onto any wharf unless the same are securely closed with metal screw plugs and not until the carrier is ready to receive the same in loading.

#### 4-6 PROHIBITED REPAIR, MANUFACTURING, CONSTRUCTION OR MAINTENANCE WORK

No combustible materials such as pitch, tar resin or oil shall be flame heated on board any vessel within the harbor nor shall any vessel be fumigated or smoke at any wharf without the permission of the Port Manager. If fumigation is to be with cyanogen products or hydrocyanic and gas in any form, the master, owner or agent shall provide, at their expense, a competent watchman satisfactory to the Port Manager to prevent unauthorized people to board while a health danger exists.

(a) No welding or burning operations of any kind, nor repair, manufacturing, construction or maintenance work which may be hazardous, shall be performed on a wharf or in the immediate vicinity of the same or on a vessel moored thereto without the permission of the Port Manager.

#### 4-7 SMOKING

Except areas designated by the Port Manager and plainly marked "No Smoking Area", smoking is permitted on the wharf and within any structure located therein.

#### 4-8 WHARFS KEPT IN CLEAN AND SANITARY CONDITION

- (a) All wharves shall be kept in a clean and sanitary condition and free from all obstructions.
- (b) The Port Manager may hire or cause to be hired laborers for the cleaning of wharves which total cost of labor and materials shall be the responsibility of and assessed against the vessel which is responsible for the necessity of cleaning.

#### 4-9 WHARF LOAD LIMITS

Loads of wharves shall not exceed the following unless otherwise authorized:

- (a) All reinforced concrete wharves:
  - 500 lbs. Per square foot over the area supported by piles, cylinders or seawall. 1,000 lbs. Per square foot over the area supported by land or fill.
- (b) All other wharves: 250 lbs. Per square foot over the area supported by piles and wooden structure. 1,000 lbs. Per square foot over the area supported by land or fill.

#### 4-10 ANIMALS

- (a) No fowl, animal or livestock of any kind subject to quarantine shall be unloaded unless first passed by the Department of Agriculture or unless arrangements have been made for acceptance for quarantine.
- (b) No fowl, animal or livestock of any kind is left or remains upon any wharf for a period of time greater than six hours, the master, owner or agent of the vessel shall provide, at their expense, proper fee and water therefor.

#### 4-11 VEHICLES

- (a) No vehicle shall be admitted upon any wharf or in any area used for the storage of cargo except for the purpose of delivery or the picking up of freight unless the operator thereof shall have received a permit from the Port manager vehicles conveying or to convey the sick or the infirm, ambulance, police and fire equipment are exempt from this provision.

- (b) All vehicles used in the handling of cargo or shipping containers shall be clearly marked to identify the owner thereof.
- (c) Speed limits of vehicles shall not exceed the following:
  - (1) Within roadways adjacent to wharves and areas used for cargo: 15 miles per hour.
  - (2) Within areas used for cargo storage: 10 miles per hour.
  - (3) On wharves: 5 miles per hour.
- (d) Any vehicle operated on any wharf or within any area used for cargo shall be under the direction and control of the Port Manager and he may cause the same to be moved or towed at the owner's risk and expense and without any liability for any damage which may result.

#### 4-12 PLACEMENT OF CARGO AND EQUIPMENT

(a) All cargo and equipment shall be placed, stored or stacked in such a way as not to impede the approaches to the same, nor to be an obstacle to the removal of other cargo, nor to cause damage to the wharf. No cargo shall be so placed as to restrict or prevent the use of mooring bits, cleats or any other device used for mooring purposes.

(b) Any cargo which in the opinion of the Port Manager is unfit to remain upon any wharf or may be harmful to other cargo on such wharf, shall be removed at the expense of the owner or consignee.

#### 4-13 DISCHARGES INTO HARBOR

(a) No rubbish, swill, garbage or refuse, ballast, rock slag, gravel, sand, earth or other similar substance shall be thrown, washed over-board or placed in any harbor.

(b) The discharge of oil sludge, oil refuse, fuel oil or molasses either directly or indirectly, or the pumping of bilges or ballast tanks containing other than clean water into the waters of any harbor or into any shore waters of Palau is strictly prohibited.

(c) Should any vessel discharge, throw wash over-board or place a prohibited substance in said waters the master thereof shall immediately notify the Director of Commercial Development and the master, owner or agent shall take such immediate action as necessary for removal of the substance from said waters upon failure of the master, owner or agent to remove said substance the Director of Commercial Development shall take such actions through government or commercial channels as are necessary for removal at the expense of the master, owner or agent.

#### 4-14 AUTHORITY TO CLOSE WHARVES OR TO REGULATE USE

The Port Manager may close the wharves or any portion thereof or regulate and control the use of the same whenever in his opinion it is advisable to do so and no person shall enter upon any wharf so closed without the permission of the Port Manager.

### **Section 5. Port Entry Fee**

Vessels shall be charged a Port Entry Fee of \$.03 per gross ton for all vessels of specified tonnage and \$5.00 for all vessels of unspecified tonnage, except that no fee shall be charged to Palau, U.S. government vessels, fishing or pleasure boats registered in Palau, or vessels reentering the harbor after leaving the same for reasons of emergency or weather or at the direction of the Port Manager.

## **Section 6. Dockage**

### 6-1 COMMENCEMENTS AND ACCRUAL

Dockage shall commence against a vessel when:

- (a) It is made fast to a wharf, dolphin or other structure.
- (b) It is occupying a berth
- (c) It is occupying an outside berth
- (d) The first boat, raft, lighter, etc. reaches the wharf.

Dockage shall accrue against said vessel until she is completely free from and vacates her mooring or until the last boat, raft, lighter, etc. leaves the wharf.

### 6-2 WAIVER

Dockage may be waived by the Director of Commercial Development in the following circumstances.

- (a) At his discretion
- (b) To Palau, and U.S. Government vessels.
- (c) To vessels and equipment engaged in harbor maintenance or improvement.

### 6-3 RATE

Dockage will be charged at the following rate for each day or fraction thereof:

- (a) Commercial and non-commercial vessels of specified tonnage: \$.03 per gross ton.
- (b) Non-commercial vessels of unspecified tonnage: \$15.00
- (c) Commercial vessels of unspecified tonnage: \$20.00

### 6-4 REDUCTIONS

One half of the dockage rate will be charged for vessels occupying an outside berth or which is using a wharf by means of boats, rafts, lighter, etc.

## **Section 7. Rentals**

When space is provided for the convenience of agents, owners and others for storage or offices uses, a fair market rental shall be negotiated by the Director of Commercial Development and charged therefor.

## **Section 8. Wharfage**

### 8-1 WAIVER

Wharfage may be waived by the Director of Commercial Development in the following circumstances:

- (a) At his discretion
- (b) Ship's stores and supplies (not including fuel) intended for vessel's own consumption and use.
- (c) Passenger baggage when accompanying passenger, not to exceed 20 cu. Ft.



(d) Cargo which has gone astray or cargo which for operational purposes the vessel must discharge and reload in order to load or discharge cargo originating at, or destined for, the wharf at which the vessel is docked.

## 8-2 RATE

Wharfage will be charged at the following rate:

- (a) Incoming oversea cargo: \$0.25 per ton or fraction thereof.
- (b) Outgoing oversea cargo: \$0.25 per ton or fraction thereof.
- (c) Inter-island or intra-island cargo: \$0.25 per ton or fraction thereof.

## 8-3 INSPECTION OF BILLS OF LADING OR CARGO MANIFESTS

All bills of lading and cargo manifests shall be available for inspection by the Director of Commercial Development or designee upon request.

## 8-4 PAYMENT

Wharfage shall be paid by the owner of the cargo upon which the charge is assessed, and the cargo shall not be removed from the wharf until the same is paid.

## **Section 9. Free Time and Penalty (Demurrage)**

### 9-1 FREE TIME

- (a) Free time for outgoing cargo shall be ten (10) days.
- (b) Free time for incoming cargo shall be seven (7) days.
- (c) In computing free time Saturday, Sundays and Holidays shall not be counted.

### 9-2 WAIVER

Demurrage may be waived by the Director of Commercial Development at his discretion.

### 9-3 RATE

Demurrage will be charged at the following rate for each day or fraction thereof:

- (a) Inside storage: \$1.00 per ton or fraction thereof.
- (b) Outside storage: \$0.10 per ton thereof.

### 9-4 COMPUTATION

- (a) Saturdays, Sundays and Holidays shall be counted in the computation of demurrage.  
[sic]
- (c) Cargo on and in trucks or any other vehicles or carriers shall be assessed demurrage in the same manner as cargo remaining directly on a wharf, pier, or terminal area.

## 9-4 [sic]PAYMENT

Demurrage shall be paid by the owner of the cargo upon which the charge is assessed, and the cargo shall not be removed from the wharf or loaded on board a vessel until the same is paid.

## **Section 10. Services**

### 10-1 UTILITIES

Electricity, water and telephone, where service is available, may be furnished at cost.

### 10-2 OTHER SERVICES

(a) Cargo handling, the running of lines and the mooring and unmooring of vessels are services provided by private stevedoring firms and not by the government. It is recommended that arrangements be made, in advance, for such services.

(b) Specialized handling equipment and tug services are not provided.

## **Section 11. Pilotage**

### 11-1 PILOTS REQUIRED

No vessel, other than Palau Government vessels, of more than 65 feet in length or exceeding 200 gross tons shall during the master's first voyage enter or leave a commercial port without a pilot aboard or unless the vessel is under the control and direction of a licensed ROP pilot. The use of a pilot on subsequent voyage is optional.

### 11-2 PRIOR NOTICE

A request for pilot service should be submitted to the Port Manager at least twelve (12) hours in advance to avoid delays in dispatching pilot.

### 11-3 NOTICE OF AMENDMENT OF ESTIMATED TIME OF DEPARTURE OR ARRIVAL

Any amendment of estimated time of departure or arrival must be received by the Port Manager two hours prior to the previously established time to avoid delay and commencement of delay or cancellation charges.

### 11-4 DELAY AND CANCELLATION CHARGES:

(a) If in the performance of his duties a pilot is detained by the failure of any vessel to arrive within one hour of the estimated time of arrival or depart within thirty minutes or the estimated time of departure without being furnished as required in Section 11-3 above a charge will be made for such detention at a rate of \$t0.00 per hour or fraction thereof in excess of the allowance provided herein.

(b) When the services of a pilot have been requested and the vessel movement is subsequently cancelled, a charge of \$100.00 will be made unless notice is furnished as required in Section 11-3 above.

#### 11-5 RATE

Pilotage will be charged at the following rate for each separate movement of a vessel:  
\$.12 per gross ton with a minimum charge of \$300.00 per movement.

[sic]

(c) Any vessel owned by ROP Government when entering, leaving or maneuvering within a harbor and while under the control and direction of the master or government employed pilot, shall be subject to one-half of the above pilotage rate unless a pilot is actually employed in which case full pilotage rates will apply.

#### 11-6 DUTIES OF PILOT AND MASTER

Upon boarding a vessel it is the duty of the pilot to pilot such vessel under the control and supervision of the master thereof. It shall be the duty of the master to acquaint the pilot with the peculiarities or possible defects of his vessel or her operations. The pilot in giving orders to the vessel shall act upon the advise and with the consent of the master. If, in opinion of the master, the pilot is negligent at any time while engaged in piloting such vessel, it shall be the duty of the master to relieve such pilot and to take such steps as the master may deem necessary to insure the safety of the vessel and to prevent damage to port facilities.

#### 11-7 LICENSING

1. The Director of Bureau of Commercial Development shall have the authority to license pilots. Further, the Director of Bureau of Commercial Development may revoke any license granted with or without cause.

#### 11-7 OPERATING PROCEDURES

(a) A pilot will aid and assist by every means in his power any vessel in distress.

(b) A pilot will offer his services in the order of priority established by the Port Manager.

(c) A pilot will pilot the vessel along such course or in such manner as directed by the Port Manager and only after having received clearance from the Port Manager.

**RPPL 6-28.**

**SIXTH OLBIIIL ERA KELULAU  
Fourth Regular Session, October 2001**

**AN ACT**

To amend 24 PNC Chapter 12 to add a new section 1201 listing definitions used in Chapter 12, to add a new section to provide for mandatory forfeiture of property used in furtherance of violations of 24 PNC Chapter 12, to provide for taxpayer enforcement, to amend 24 PNC 1231 (d) to increase the penalty for illegal taking, possessing, or exporting of dugongs; and for other related purposes.

**THE PEOPLE OF PALAU REPRESENTED IN THE OLBIIIL ERA KELULAU DO ENACT AS FOLLOWS:**

**Section 1.** Legislative Findings. The Olbiil Era Kelulau finds that the dugong is an intrinsic part of Palauan culture and has played an important role in our heritage for many generations. Dugongs are special creatures, living in only four countries in the Pacific. In Micronesia, dugongs only occur in Palau, and they are the most isolated dugong population in the world. It is unlikely that our population is supplemented by recruits from other countries. The Olbiil Era Kelulau finds that the dugong, which previously thrived in the waters of Palau, is now at a critical point, facing the threat of local extinction. The dugong is internationally listed as vulnerable to extinction by the World Conservation Union (IUCN) and as endangered by the United States. The entire local population has been estimated at no more than 200 and could be as low as 50 animals, making the dugong perhaps the most endangered of all animals found within the jurisdiction of Palau. Fortunately, the population, while extremely small, still appears to be viable and is reproducing slowly. Dugongs live for many years, but are slow at reproducing, not reaching maturity until up to age seventeen, and only able to have one calf every three to seven years. In perfect conditions, a dugong population can only grow at less than five percent per year. Given a chance, the dugong may once again become common in Palauan waters to the delight of the children and the enjoyment of future generations of all Palauans. The Olbiil Era Kelulau further finds that existing laws intended to protect the dugong have been inadequate to reverse the decline in the local dugong population. The Olbiil Era Kelulau therefore finds that in order to ensure the long-term survival of the Palauan dugong, it is necessary to increase the penalties for the hunting of dugongs, to develop regulations and special programs to enable an increase in the population, to protect the dugong's habitat, and to promote public education about the dugong.

**Section 2.** Amendments. 24 PNC Chapter 12, Subchapters 1, IV, and VIII are amended to read as follows:

(a) 24 PNC Chapter 12, Subchapter 1, is hereby amended to add a new section 1201 setting forth definitions used throughout 24 PNC Chapter 12, and a new section 1202 regarding mandatory forfeiture, citizen and resident actions, and enforcement, as follows:

“Subchapter I. General Provisions: Enforcement

**Section 1201.** Definitions. Unless the context otherwise requires, in this chapter:

(a) "Dugong" means an individual animal of the species *Dugong dugon*, known in the Palauan language as *mesekiu*.

(b) “Export” means an actual or attempted shipment, transport, or transfer of protected sea life out of the Republic of Palau; or a transfer of protected sea life to any person within the Republic of Palau with the knowledge, belief, or intent that the sea life will be shipped, transported, or transferred out of the Republic of Palau.

c) “Minister” means the Minister of Resources and Development.

(d) “Person” means any individual, corporation, partnership, trust, association, or other legal entity; the government of the Republic of Palau, any of its subdivisions, or any officer, employee, agent, department, or instrumentality thereof; and any foreign government, or subdivision thereof.

(e) “Possess” means the holding of any protected sea life by any person, or possession of protected sea life on his or her property, boat, vehicle, home, place of business, place of work, or any other location under his or her control.

(f) “Protected sea life” means all species protected pursuant to this chapter, or parts or products thereof.

(g) “Resident” means a natural person, other than a citizen, who holds an entry permit authorizing his or her presence in the Republic for a period of one year or more from its date of issue.

(h) “Take” means to capture, collect, harass, harm, hunt, kill, shoot, trap, wound, or to attempt to engage in any such conduct.

**Section 1202. Mandatory civil forfeiture, citizen or resident actions; enforcement.**

(a) In addition to any other penalty authorized by law, all protected sea life, or parts or products thereof, taken, possessed, exported, sold, purchased, or offered for sale or purchase in violation of the provisions of this chapter, or any permits issued hereunder, shall be forfeited to the Republic. All property used in furtherance of a violation of this chapter, including but not limited to boats, boat engines, automobiles, nets, spears, and equipment of whatever kind, shall be forfeited to the Republic upon proof, by a preponderance of the evidence, of the use of such property in furtherance of a violation under this chapter.

(b) Any citizen or resident of the Republic may commence a civil action in the Supreme Court against any person to enjoin violations of any provision of this chapter, and to obtain forfeiture to the Republic as authorized by subsection (a) of this section. Before a citizen or resident may bring an action pursuant to this section, the citizen or resident shall submit a written request to the Attorney General and Special Prosecutor requesting that either bring a forfeiture action under subsection (a) of this section. If the Attorney General and Special Prosecutor fail to bring the action within 30 days after receipt of the written request, the citizen or resident may thereafter commence an action pursuant to this section. A citizen or resident who prevails in an action brought pursuant to this section shall be awarded his or her expenses incurred in such action, including but not limited to reasonable attorney's fees, costs, expert witness fees, and other expenses incurred in investigating the violation.

©) Any person who reports information to the Attorney General or Special Prosecutor regarding a violation of 24 PNC Chapter 12 that results in a conviction shall receive, as a reward therefor, 50% of any fine actually collected from the violator.

(d) All laws protecting the dugong, except as provided in subsections (b) and ©), shall be enforced by the Bureau of Public Safety, state law enforcement officers, and such personnel of the Bureau of Natural Resources and Development as the Minister designates.”

(b) 24 PNC 1231 is amended as follows:

**Section 1231. Conservation of dugongs.**

(a) No person shall take, possess, export, or otherwise have under his or her control any dugong or any part or product thereof, except as provided for in subsections (b) and ©). The Minister may promulgate regulations making lawful the possession of existing *olecholl* bracelets under specified circumstances, holding a 90-day period for registration of existing *olecholl* bracelets. Circumstances under which possession of an *olecholl* bracelet existing on the effective date of this subsection may be permitted by the Minister include, without limitation, if the *olecholl* bracelet is clan or family property, is of general historical significance, or is customarily worn by the holder of a traditional title. Regulations shall provide for the photographing of existing *olecholl* bracelets and, if necessary, other reliable means of identifying registered dugong products existing on the effective date of this subsection. Beginning on the 91st day after the effective date of this subsection, unregistered *olecholl* bracelets shall be presumed to result from an unlawful taking of a dugong. No person shall sell, purchase, or offer for sale or purchase any dugong or any part or product thereof.

(b) The Minister may grant a permit for the taking, possession, or export of any dugong, or any part thereof, for scientific or educational purposes, pursuant to regulations promulgated by the Ministry of Resources and Development within 120 days of the effective date of this subsection. The regulations and permits issued thereunder shall set forth durational limitations on the effectiveness of permits, permitted activities, the number of dugongs or parts thereof that may be taken, and such other limitations and conditions as may be appropriate for the protection of dugongs in the Republic. Permits shall bear the signature of the Minister. A permit may be granted only if it contributes to the protection of the individual dugong, or the maintenance or recovery of the Palauan dugong population or the dugong species as a whole.

©) If any dugong is accidentally taken, it must be released immediately whether dead or alive. Any person who places or uses a fishing net, trap, wire, stone weir, or other such equipment shall monitor the fishing equipment so as to prevent accidental dugong deaths, and shall immediately release any living dugong caught by such equipment. If found dead a dugong shall be left where it was found, and no part of the dugong may be removed, except by law enforcement personnel, unless authorized by a permit issued by the Minister pursuant to subsection (b) of this section. The person finding the dead dugong must immediately report the finding to the Minister or the Director of the Bureau of Natural Resources and Development, or to a law enforcement agency. The Minister shall promulgate regulations regarding the gathering and disposal of any dead dugong, including ascertaining of the cause of death if possible.

(d) A person found guilty of violating subsection (a), (b), or ©) of this section shall, upon conviction, be imprisoned for a period of at least three months but not more than one year, or fined not less than \$5,000 nor more than \$10,000 or both, for the first violation; for every violation thereafter, the convicted person shall be imprisoned for at least six months but not more than three years, fined not less than \$10,000 nor more than \$20,000 or both. Each dugong, or part or product thereof, taken, possessed, exported, sold, purchased, or offered for sale or purchase shall constitute a separate violation.”

©) 24 PNC Subchapter IV is further amended by the addition of new subsections 1232 and 1233, to read as follows:

**Section 1232. Public education about dugongs.** The Minister, in conjunction with the Minister of Education, shall promulgate regulations establishing educational programs for Palauan citizens and the general public about the dugong, its characteristics and habits, the impact of habitat loss or degradation on the survival of the species, the importance of the dugong in Palauan culture, and its threatened status. Nongovernmental organizations such as the Palau International Coral Reef Center, The Nature

Conservancy, and the Marine Resource Pacific Consortium shall be consulted in developing educational programs.

**Section 1233.** Habitat impact statements. The Minister shall promulgate regulations requiring any entity proposing new development to include an Environmental Impact Statement considering the potential impact of such development on dugongs and their habitats. Those regulations shall include a checklist of issues that proponents must address. The Minister or the Environmental Quality Protection Board can deny a permit or require appropriate mitigation measures if there could be harm to a dugong habitat by any construction.”

(d) 24 PNC 1201 regarding turtles is redesignated as 24 PNC 1281, within a new subchapter VIII, as follows:

"Subchapter VIII. Turtles.

**Section 1281.** Limitations on taking of turtles.

....”

**Section 3.** Effective date. This Act shall take effect upon its approval by the President, or upon becoming law without such approval, except as otherwise provided by law.

PASSED: October 31, 2002

Approved this 20th day of November, 2002.

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/s/

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Tommy E. Remengesau, Jr., President  
Republic of Palau

**RPPL 6-36**  
**SIXTH OLBIIIL ERA KELULAU**

Fourth Regular Session, October 2001

**AN ACT**

To amend Chapter 1 of Title 27 of the Palau National Code to prohibit foreign fishing vessels from fishing within a 50 nautical mile radius to the east of the reef entrance to Malakal Harbor; to prohibit foreign fishing vessels from taking reef fish, turtles, rays, sharks, and marine mammals; to prohibit foreign fishing vessels from using steel leaders; to increase the penalties for certain violations of the chapter; to harmonize the scope of the Republic's maritime jurisdiction with the provisions of the United Nations Convention on the Law of the Sea (UNCLOS); to add a new section 174 to 27 PNC to establish a tax on billfish of 40% of the actual revenues derived from the sale of billfish off-loaded and sold in the Republic; and for related purposes.

**THE PEOPLE OF PALAU REPRESENTED IN THE OLBIIIL ERA KELULAU DO ENACT AS FOLLOWS:**

**Section 1.** Legislative Findings. The Olbiil Era Kelulau finds that the Republic of Palau must take bolder steps to protect and develop the Republic's marine resources for the benefit of the people of Palau. The Republic receives a very small percentage of the value of the tuna and other fish harvested from our waters by foreign fishing vessels. At the same time, foreign fishing vessels are depleting the Republic's national waters of fish and other marine life at an alarming rate. Foreign fishing vessels often take "by-catch" including marlin, sailfish, swordfish, and sharks. Some foreign fishing vessels also engage in the mutilation of sharks in a practice commonly known as "finning." This rapid depletion of marine resources endangers the continued viability of some species and forever alters the delicate ecological balance of life in the Republic's waters. Foreign fishing vessels also create additional environmental and aesthetic problems. These vessels discharge waste and other pollution into the Republic's waters, damaging marine life and threatening public health and safety. The fishing vessels are also eyesores that diminish the Republic's natural beauty. This undoubtedly has a negative impact on tourism, the Republic's largest and most important industry today and probably well into the future. In addition, efforts are underway to encourage the development of a sustainable sportfishing industry in the Republic. The presence and non-sustainable activities of foreign fishing vessels harm both of these industries irreparably. Therefore, the Olbiil Era Kelulau finds that the Republic must take all appropriate measures to reduce the negative impact of those foreign fishing vessels that are fishing in the Republic's waters and to encourage development of the local fishing industry. Accordingly, the prohibition of steel leaders is intended to reduce the likelihood of catching sharks. The Olbiil Era Kelulau further finds that since the Republic of Palau ratified the United Nations Convention on the Law of the Sea (UNCLOS) in September 1996, several provisions of Title 27 of the Palau National Code are inconsistent with the terms of UNCLOS. Consistent with its obligations under UNCLOS, the Olbiil Era Kelulau finds that the Republic's domestic fishing laws must be amended in light of our international treaty obligations, to prohibit imprisonment for violations of the Republic's fishing laws and to clarify the scope of the Republic's maritime jurisdiction.



**Section 2.** Amendments. Chapter 1 of Title 27 of the Palau National Code is amended to read as follows:

“§ 102. Definitions.

....

(f) “Foreign fishing agreement” means an agreement approved by the national government and a foreign government or one or more foreign commercial fishing interests to permit foreign vessels to harvest fish within the exclusive economic zone of the Republic.

(g) “Foreign fishing” means fishing by vessels not duly registered in the Republic pursuant to Title 7 of this Code, or fishing by vessels that have been issued a permit pursuant to sections 167 through 172 of this Title.

....

(1) “Steel leader” means a type of fishing line made out of steel which connects fishing line to fishing hooks.

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(m) “Stock of fish” means. . . .

(n) “Submerged reef” means. . . .

(o) “Ministry” means. . . .

(p) “Minister” means. . . .

....

§ 123. Ministry of Resources and Development; functions and duties with respect to foreign fishing agreements. The Ministry, in addition to its functions and duties as set forth in Title 2, shall have the following duties, functions, and authority:

(a) to adopt regulations for the conservation, management, and exploitation of all living resources in the contiguous zone and exclusive economic zone of the Republic pursuant to sections 125 and 144 of this title;

(b) to negotiate and conclude. . . .

(c) to issue foreign fishing permits. . . .

(d) to perform such other functions. . . .

. . . .

§ 142. Territorial sea; internal waters.

(a) There is hereby established a territorial sea of twelve miles’ breadth. The inner boundary of the territorial sea of each island or atoll is the baseline as defined in section 141 of this title. The outer boundary is a line, every point of which is twelve nautical miles seaward of the nearest point on the baseline.

(b) . . . .

§ 143. Contiguous zone.

(a) There is hereby established a contiguous zone adjacent to the territorial sea. The inner boundary of the contiguous zone of each island or atoll is the seaward boundary of the territorial sea, and the outer boundary is a line, every point of which is 24 nautical miles seaward of the nearest point on the baseline as defined in section 141 of this title.

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(b) The national government possesses and may exercise the same sovereign rights to living resources in the contiguous zone as it does in the territorial sea.

§ 144. Exclusive economic zone.

(a) There is hereby established an exclusive economic zone adjacent to the contiguous zone. The inner boundary of the exclusive economic zone of each island or atoll is the seaward boundary of the contiguous zone, and the outer boundary is a line, every point of which is 200 nautical miles seaward of the nearest point on the baseline as defined in section 141 of this title unless otherwise limited by international law or agreement.

(b) The national government shall have exclusive management, conservation, and regulatory authority over all living resources within the exclusive economic zone to the full extent recognized by international law.

.....

§ 161. Foreign fishing restricted.

(a) No foreign fishing vessel may fish in the territorial sea, internal waters, contiguous zone, or at any point within a 50 nautical mile radius to the east of the reef entrance to Malakal Harbor; provided, that a foreign fishing company which, on the effective date of this subsection, is a party to a foreign fishing agreement and which holds valid permits issued pursuant to that agreement and this chapter, may continue to fish consistent with the foreign fishing agreement until it expires.

(b) Foreign fishing is permitted only in the exclusive economic zone outside a 50 nautical mile radius to the east of the reef entrance to Malakal Harbor as provided in this chapter, and only in compliance with the laws of the Republic, any applicable regulations, any permit issued, and any provision of a fishing agreement entered into with the Republic.

.....

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§ 163. Same; terms and conditions Ministry is to seek. In negotiating foreign fishing agreements, the Ministry shall . . . .

(a) . . . .

(b) . . . .

(c) The foreign party and the owners or operators of all of the fishing vessels of such party shall not, in any year, exceed such party's allocation of the total allowable level of foreign fishing.

(d) . . . .

(1) . . . .

(2) . . . .

(3) abide by the requirement that no foreign fishing will be permitted in the exclusive economic zone of the Republic without a valid and applicable permit, and the requirement that all conditions and restrictions of the permit be complied with.

(e) . . . .

.....

§ 165. Same; allocation among foreign nations of allowable level of fishing; sustainable limits. The Bureau by annual regulations . . . .

- (a) . . . .
- (b) . . . .
- (c) . . . .

The regulations shall establish the total allowable level of foreign fishing, catch limits, and allocation thereof so as to ensure the long-term sustainability and health of every stock of fish, populations of living resources and reef fish, and submerged reef, with in the territorial sea, internal waters, contiguous zone, and exclusive economic zone of the Republic.

. . . .

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§ 167. Fishing permits; in general.

- (a) A foreign fishing vessel may engage in fishing in the exclusive economic zone of the Republic only if such vessel has on board a valid permit issued under this chapter for such vessel.
- (b) . . . .

§ 168. Same; application process.

(a) Each foreign party requesting permits in accordance with its foreign fishing agreement shall make application on forms prescribed by the Bureau specifying, among other things:

. . . .

- (4) the amount of fish or tonnage of catch contemplated for each such vessel during the time such permit is in force;
- (5) the ocean area in which, and the season or period during which, such fishing will be conducted; and
- (6) the species of fish, listed by the individual scientific name, that each such vessel may catch during the time its permit is in force.

. . . .

§ 169. Same; fees and compensation. Fees and other forms of compensation for the right to exploit living resources within the exclusive economic zone of the Republic shall be established in the foreign fishing agreement.

§ 170. Same; consequences of prohibited act. If any foreign fishing vessel for which a permit has been issued pursuant to this chapter has been used in the commission of any act prohibited by law, regulations, or the terms, conditions; or restrictions set forth in the foreign fishing agreement or permit relating to such vessel, or if any civil penalty or criminal fine imposed by law has not been paid and is overdue, the Bureau shall revoke such permit with prejudice to the right of the foreign party involved to obtain a permit for such vessel in any subsequent year.

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§ 171. Same; noncommercial fishing. Notwithstanding any other provision of this chapter, the Bureau may by regulation provide for the issuance of permits, on reasonable conditions, to foreign vessels or parties for research, recreational, or other noncommercial fishing within the exclusive economic zone of the Republic.

§ 172. Same; bait fish. Notwithstanding any other provision of this chapter, a foreign fishing vessel . . . fishing permit to be issued by the Bureau. Special bait fishing permits . . . within the territorial sea,

internal waters, contiguous zone, and exclusive economic zone of the Republic, that may be affected by the harvesting of such bait fish.

....

§181. Prohibited acts. It is unlawful for any person:

- (a) to use any foreign fishing vessel to fish, as that term is defined in 27 PNC Chapter 12, for any reef fish, turtle, ray, or marine mammal, or any part of any such fish or marine mammal, or otherwise intentionally mutilate or injure any such fish or marine mammal. If any such fish or marine mammal is inadvertently caught or captured alive, it shall be released in the manner that affords it the greatest opportunity for survival;
- (b) to use steel leader as fishing gear on any foreign fishing vessel or to possess steel leader on any foreign fishing vessel while in the internal waters, territorial sea, or contiguous or exclusive economic zones of the Republic;
- (c) to violate any provision of this chapter . . .
- (d) to use any fishing vessel . . .
- (e) to violate any provision of, or regulations under, an applicable . . .
- (f) to refuse to permit any officer authorized to enforce the provisions of this chapter to board a fishing vessel subject to such person's control for purposes of conducting any search or inspection in connection with the enforcement of this chapter or any regulation, permit, or agreement referred to in subsections (c), (d), or (e) of this section;
- (g) to forcibly assault, resist, oppose, impede, intimidate, or interfere with any such authorized officer in the conduct of any search or inspection described in subsection of this section;
- (h) to resist a lawful . . .
- (i) to knowingly ship, transport, offer for sale, sell, purchase, import, export, or have custody, control, or possession of any fish taken or retained in violation of this chapter or any regulation, permit, or agreement referred to in subsections (c), (d), or (e) of this section; or
- (j) to interfere with, delay . . .
- (k) to use any foreign fishing vessel to fish, as that term is defined in 27 PNC Chapter 12, for any shark, or any part of any such, or to remove the fins of or otherwise intentionally mutilate or injure any such shark. If any shark is inadvertently caught or captured, it shall be immediately released, whether dead or alive; if the shark is caught or captured alive, it shall be released in the manner that affords it the greatest opportunity for survival.

§ 182. Criminal penalties.

- (a) . . . .
- (b) Any offense described as a prohibited act by section 181(a), (b), (c), (d), (e), or (k) is punishable by a fine of not more than \$250,000.
- (c) Any offense described as a prohibited act by section 181 (f), (g), (h), (i), or (j) is punishable by a fine of not more than \$500,000 for each violation; except that if in the commission of any such offense the person uses a dangerous weapon, engages in conduct that causes bodily injury to any officer authorized to enforce the provisions of this chapter, or places any such officer in fear of imminent bodily injury, the offense is punishable by a fine of not more than \$1,000,000 for each violation. Each day of continuing violation shall be considered a separate offense.
- (d) These penalties shall be levied in addition to any other penalties that may be applicable under other statutes.

§ 183. Civil Penalties.

(a) Any person who is found by the Supreme Court in a civil proceeding to have committed an act prohibited by section 181 of this title shall be liable to the national government for a civil penalty which shall not exceed \$500,000 for each violation. Each day of continuing violation shall constitute a separate offense.

(b) . . . .

(c) The Attorney General, or any person residing within the Republic, is authorized to initiate proceedings under this section and to recover the amount assessed as a civil penalty and to obtain injunctive relief to prevent violations of law or to compel compliance with law.

(d) Before initiating a civil proceeding pursuant to subsection (c), a resident of the Republic shall file with the Attorney General a written request for the Attorney General to initiate the proceeding. The request shall include a statement of grounds for believing a cause of action exists. The Attorney General shall respond within 30 days after receipt of the request indicating whether he or she will initiate a proceeding under subsection (c). If the Attorney General files a complaint within that 30-day period, no further proceeding may be brought by the informant unless the proceeding brought by the Attorney General is dismissed without prejudice and is not re-filed by the Attorney General within 60 days thereafter.

(e) The proceeds of civil penalties shall be remitted to the National Treasury in accordance with section 185 and section 189 of this title.

§ 184. Forfeitures; procedure.

. . . .

(g) For purposes of this chapter, it shall be a rebuttable presumption that any fish or steel leader found on board a fishing vessel which is seized in connection with an act prohibited by section 181 of this title was taken, or retained, or used in violation of this chapter.

(h) The Attorney General shall commence forfeiture proceedings on a fishing vessel used in any manner in connection with an act prohibited by this chapter if the owner of that vessel is unable to pay all civil or criminal penalties levied for violations of this chapter.

. . . .

§ 189. Same; reward. Any individual . . . such penalty imposed and collected. Any individual who initiates a civil proceeding pursuant to section 183 of this chapter shall receive from the national government an amount equal to fifty percent of the civil penalties actually collected, and shall be entitled to recover from the defendants his costs of litigation, including reasonable attorneys' fees.

. . . .”

**Section 3. Effective date.** This Act shall take effect upon its approval by the President, or upon becoming law without such approval, except as otherwise provided by law.

PASSED: August 20, 2003

Approved this 5th day of Sept., 2003.

\_\_\_\_\_  
/s/

Tommy E. Remengesau, Jr.

President of the Republic of Palau

RECEIVED OCT 31 2006



The Senate  
SEVENTH OLBIIL ERA KELULAU

P.O Box 8, Koror  
Republic of Palau 96940

EIGHTH REGULAR Session

October 2006

INTRODUCED AS SENATE BILL NO. 7-94, SD1, PD1

AN ACT

Establishing a recycling program for the Republic of Palau, establishing a beverage container deposit fee, creating a Recycling Fund; and for other related purposes.

INTRODUCED BY SENATOR (S) CALEB T. OTTO

ET, AL.,

DATE INTRODUCED August 25, 2005

SENATE ACTION

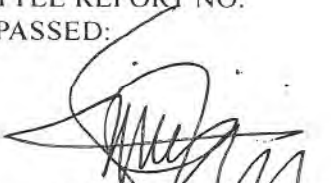
FIRST READING: August 25, 2005  
 REFERRED TO: Youth Affairs & Social Welfare  
 STANDING COMMITTEE REPORT NO: 7-80 / Special Com. Report 7-9  
 DATE ADOPTED: October 29, 2005  
 SECOND READING: October 29, 2005  
 LEGAL FORMAT: Proper  
 REVIEW: November 1, 2005  
 THIRD READING: November 1, 2005  
 FINAL READING: October 10, 2006

HOUSE ACTION

FIRST READING: January 10, 2006  
 REFERRED TO: Resources and Development  
 STANDING COMMITTEE REPORT NO: 7-119  
 DATE ADOPTED: August 24, 2006  
 SECOND READING: August 24, 2006  
 LEGAL FORMAT: Proper  
 REVIEW: August 24, 2006  
 THIRD READING: August 25, 2006  
 FINAL READING: October 17, 2006

CONFERENCE COMMITTEE ACTION

DATE: None  
 COMMITTEE REPORT NO: None  
 DATED PASSED: None

  
 Wilbur Williams

CLERK OF THE SENATE

  
 Betty M. Ingereklii

HOUSE CLERK

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AN ACT

Establishing a recycling program for the Republic of Palau, establishing a beverage container deposit fee, creating a Recycling Fund; and for other related purposes.

THE PEOPLE OF PALAU REPRESENTED IN THE OLBIIL ERA KELULAU DO ENACT AS FOLLOWS:

1           Section 1. Findings and purpose. The Olbiil Era Kelulau finds that:

2           (a) One of Palau's most visible forms of pollution in the Republic of Palau is the  
3           dumping of beverage containers throughout the island;

4           (b) The recycling program will help address the increasing concern over limited  
5           sites for landfills throughout the nation;

6           (c) The existence of improperly disposed waste beverage containers increases the  
7           hazards to health and safety for people and the environment;

8           (d) The lack of a nationwide recycling program is a clear burden to protection  
9           of our environmental resources as well as the growth of the tourism industry in Palau;  
10          and

11          (e) The planning, development, and operation of a national recycling program  
12          based upon a deposit fee for beverage containers is a self-funding means of addressing  
13          these concerns without significant cost to the citizens of Palau.

14          Section 2. Definitions. Unless the context clearly indicates otherwise, the  
15          following meanings shall apply to this Act:

16          (a) "Deposit Beverage" means beer, ale, or other drink produced by fermenting  
17          malt, mixed spirits, mixed wine, tea and coffee drinks, regardless of dairy-derived  
18          product content, soda, or non-carbonated water, and all nonalcoholic drinks in liquid  
19          form and water intended for internal human consumption that is contained in a deposit  
20          beverage container.

21          The term "deposit beverage" does not include the following:

22                 (1) A liquid, which is:

1 (i) a syrup

2 (ii) In a concentrated form; or

3 (iii) Typically added as a minor flavoring ingredient in food or  
4 drink, such as extracts, cooking additives, sauces, or condiments.

5 (2) A liquid which is ingested for medicinal purposes only;

6 (3) A liquid that is designed and consumed only as a nutritional  
7 supplement and not as a beverage;

8 (4) Products frozen at the time of sale to the consumer, or in the case of  
9 institutional uses such as hospital, at the time of sale to the users;

10 (5) Products designed to be consumed in a frozen state;

11 (6) Instant drink powders;

12 (7) Seafood, meat, or vegetable broths, or soups, but not juices; and

13 (8) Milk and all other dairy-derived products, except tea and coffee  
14 drinks with trace amounts of these products.

15 (b) "Deposit Beverage Container" means the individual, separate, sealed, glass,  
16 polyethylene terephthalate, high density polyethylene, or metal container less than or  
17 equal to thirty-two fluid ounces, used for containing, at the time of sale to the consumer,  
18 a deposit beverage intended for use or consumption in the Republic.

19 (c) "Deposit Beverage Distributor" means a person who is a manufacturer of  
20 beverages in deposit beverage containers in the Republic, or who imports and engages  
21 in the sale of filled deposit beverage containers to a dealer or consumer. The term does  
22 not include airlines and shipping companies that merely transport deposit beverage  
23 containers, unless said containers are deposited in Palau.

24 (d) "Import" means to buy, bring, or accept delivery of deposit beverage  
25 containers from an address, supplier, or any entity outside of the Republic.

26 (e) "Importer" means any person who buys, brings, or accepts deliver of deposit



1 containers from outside the Republic for sale or use within the Republic.

2 (f) "Minister" means the Minister of Resources and Development.

3 (g) "Ministry" means the Ministry of Resources and Development.

4 (h) "Redeemer" means a person, other than a dealer or distributor, who  
5 demands the refund value in exchange for the empty deposit beverage container.

6 Section 3. Recycling program. There is hereby established a Recycling Program  
7 in the Republic of Palau. The purpose and aim of the Recycling Program is to create a  
8 self-supported, safe and efficient system of disposal of beverage container throughout  
9 Palau.

10 Section 4. Declaration of authority.

11 (a) The Ministry shall have the duty and authority to administer the Recycling  
12 Program. Such authority includes, but is not limited to, the administration of the  
13 Recycling Fund, the hiring of employees and contractors and consultants, the purchasing  
14 and selling of property and services, the leasing or obtaining interests in land on behalf  
15 of the National Government, the receipt of donations and contributions, and the entering  
16 into agreements to further the proposes of the Recycling Program.

17 (b) As the responsible agency for the Republic of Palau, the Ministry may, from  
18 time to time, delegate or contract out the administration of the Recycling Program to  
19 other governmental agencies of the National Government, State Governments or private  
20 companies; PROVIDED that the ultimate responsibility and authority for the Recycling  
21 Program shall rest with the Minister of Resources and Development.

22 Section 5. Recycling fund.

23 (a) There is hereby established a revolving fund within the National Treasury  
24 that shall be known as the "Recycling Fund," to be maintained by the Ministry of  
25 Finance, separate and apart from other funds of the National Treasury. Independent  
26 records and accounts shall be maintained in connection therewith.

1           (b) All revenue received from deposit fees received pursuant to this Act, or the  
2 sale of beverage containers under the provisions of this Act, appropriations by the Palau  
3 Legislature, any grants, donations and contributions to the Recycling Program, and any  
4 interest or income earned on the money in the Recycling Fund shall be deposited into the  
5 Recycling Fund.

6           (c) Except when specific requirements are imposed by law or by the grantor or  
7 donor, the Recycling Fund shall be first applied to the expenses attributable to the  
8 administration of the Recycling Program, then to the payments required under Section  
9 6 of this Act, then to a reserve to cover anticipated and unanticipated future expenses of  
10 the program. The Ministry may also use the money to:

11                   (1) Fund administrative, audit, and compliance activities associated with  
12 collection and payment of the deposits and handling fees of the deposit beverage  
13 container fee and deposit program;

14                   (2) Conduct recycling education and demonstration projects; and

15                   (3) Promote recyclable market development activities.

16           (d) Money in the fund is hereby authorized and is hereby appropriated and may  
17 be obligated or expended without further legislative action for the purposes stated in this  
18 Act.

19           (e) The Minister shall, not later than 90 days after the close of each fiscal year,  
20 submit to the President and Olbiil Era Kelulau (OEK) a complete report showing its  
21 activities under the Recycling Program and the use and condition of the Recycling Fund,  
22 and such other matters that The Ministry deems appropriate. The activities concerning  
23 the Recycling Fund shall be examined by the Public Auditor at least annually, and the  
24 report of such examination shall be supplied to the President and the OEK.

25           Section 6. Deposit fee. A beverage distributor shall pay to the Ministry a deposit  
26 beverage container fee on each deposit beverage container manufactured in or imported

1 to the Republic. The fee shall be imposed only once on the same beverage container.  
2 The fee shall be \$0.10 per beverage container. The Ministry shall evaluate the amount  
3 of deposit beverage containers recovered during the first six months of the fully  
4 implemented deposit beverage container deposit program and recommend to the OEK  
5 any modification in the fee structure necessary to meet the deposit beverage container  
6 deposit program funding requirements. This section shall become effective four months  
7 after the effective date of this Act.

8 **Section 7. Deposit beverage refund.** Using the monies in the Recycling Fund, the  
9 Minister shall purchase beverage containers for \$0.05 per container. Beverage  
10 containers may only be purchased through redemption centers established pursuant to  
11 Section 8 of this Act. The Minister shall sell beverage containers for recycling at market  
12 prices. This section shall become effective four months after the effective date of this  
13 Act.

14 **Section 8. Redemption centers.**

15 (a) To facilitate the return of empty beverage containers, the Ministry shall  
16 establish one or more redemption centers at which empty beverage containers may be  
17 returned and payment received. Any person may operate a redemption center subject  
18 to the approval of the Minister.

19 (b) The application for approval of a redemption center shall be filed with the  
20 Ministry and contain such information as the Ministry may require.

21 (c) The approval of a redemption center may contain such terms and conditions  
22 as the Ministry deems appropriate. Such terms and conditions may differ among  
23 redemption centers and may be altered or amended from time to time as the situation  
24 warrants. Using the money in the Recycling Fund, the Minister may provide  
25 compensation not to exceed \$0.025 per container to the redemption centers for their  
26 services.

1 (d) The Minister may withdraw the right to serve as a redemption center at any  
2 time for noncompliance with the terms and conditions of this Act, or the rules and  
3 regulations adopted pursuant to Section 10 of this Act.

4 Section 9. Deposit beverage distributors, registration and record keeping  
5 requirements. Four months after the effective date of this Act, all deposit beverage  
6 distributors operating within the Republic shall register with the Ministry, using forms  
7 prescribed by the Ministry, and shall notify the Ministry of any changes in address or  
8 other information previously submitted.

9 (a) After this Act is enacted, any person who desires to conduct business in the  
10 Republic as a new deposit beverage distributor shall register with the Ministry no later  
11 than one month prior to the commencement of the business.

12 (b) All deposit beverage distributors shall maintain records reflecting the  
13 manufacture of their beverages in deposit beverage containers as well as the importation  
14 of deposit beverage containers. The records shall be made available, upon request, for  
15 inspection by the Ministry; provided that any proprietary information obtained by the  
16 Ministry shall be kept confidential and shall not be disclosed to any other person, except:

17 (1) As may be reasonably required in an administrative or judicial  
18 proceeding to enforce any provision herein, or

19 (2) Under an order issued by a court.

20 Section 10. Rules and regulations.

21 (a) The Minister may promulgate, amend and enforce appropriate rules and  
22 regulations to carry out the duties and powers set forth herein, which may include, but  
23 are not limited to, provisions governing:

24 (1) The collection, purchase, sale or other disposal of beverage containers;

25 (2) The type and condition of the beverage containers that may be  
26 redeemed;

- 1           (3) The methods and requirements for the redemption of the beverage  
2 containers;
- 3           (4) All matters concerning the operation of redemption centers;
- 4           (5) The prohibition of importing empty beverage containers for the  
5 purpose of redeeming them in Palau; and
- 6           (6) Other matters necessary for the administration of this Act.

7           The power of the Minister to establish such rules and regulations is subject to the  
8 powers of the Minister of Finance to establish rules and regulations regarding the  
9 collection of the deposit fee and the establishment and operation of the Recycling Fund  
10 as set forth in Section 15 of this Act.

11           (b) The Minister of Finance shall promulgate, amend and enforce appropriate  
12 rules and regulations regarding the collection of the deposit fee and the establishment  
13 and operation of the Recycling Fund.

14           All rules and regulations established under this act shall be adopted pursuant to  
15 the Administrative Procedures Act.

16           Section 11. Appropriation. The sum of \$100,000 is hereby authorized to be  
17 appropriated for expenditure and obligation for Fiscal Year 2007 for the purpose of  
18 providing start-up funds for the Palau Recycling Program, for the collection of deposit  
19 containers already on the island and for the exercise of the powers and duties set forth  
20 herein. Such sums shall be deposited into the Recycling Fund and shall be administered  
21 in accordance with this Act. Any unexpended or unobligated balance of this  
22 appropriation shall not lapse at the end of the fiscal year.

23           Section 12. Payment. The deposit fee levied under Section 6 of this Act shall  
24 attach as follows:

- 25           (a) If intended for resale, at the time of the first retail sale in Palau; and  
26           (b) If intended for personal use, at the point of import.

1 All deposits that have attached during a calendar month shall be paid to National  
2 Treasury on or before the fifteenth day of the succeeding month and shall be  
3 administered by the Minister of Finance. Deposit fee revenues not paid within the time  
4 specified shall be considered delinquent.

5 Section 13. Procedure. The first seller of beverages subject to the deposit fee  
6 under this Act shall keep accurate records of all sales of the beverages subject to this Act,  
7 and shall provide the Ministry of Finance with supporting documents to substantiate the  
8 accuracy of all reports filed.

9 Section 14. Presumption. It shall presumed that all beverage containers are  
10 subject to the deposit fee imposed by this Act until the contrary is proved, and the  
11 burden of proving that a beverage container is not subject to the deposit fee shall be  
12 upon the seller.

13 Section 15. Prepayment. The first seller of beverage containers shall have the  
14 option of prepaying all deposit fees due under this Act in accordance with regulations  
15 issued by the Minister of Finance.

16 Section 16. Lien on property. All deposit fees imposed under this Act shall be a  
17 lien upon any property of the person obligated to pay the deposit fees and may be  
18 collected by levy upon such property in the same manner as the levy of an execution.

19 Section 17. Civil penalty. All deposit fees due under this Act shall be subject to  
20 a penalty of five percent (5%) of the unpaid fees due per month or portion thereof that  
21 such fees remain unpaid.

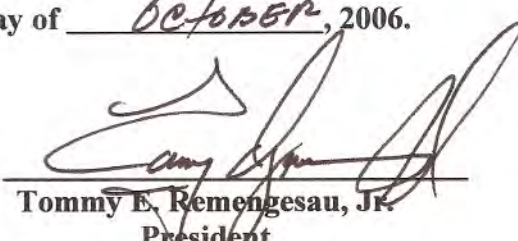
22 Section 18. Criminal penalty. Any person who knowingly, willfully and  
23 unlawfully violates or refuses to comply with any provision of this Act, or with any  
24 regulation duly issued by the Minister of Finance or the Minister of Resources and  
25 Development for the enforcement of this Act shall, upon conviction thereof, be  
26 imprisoned for not more than ninety (90) days and/or fined not more than five hundred

1 dollars (\$500.00). The criminal penalties are in addition to the civil penalties that may  
2 be due under this Act.

3 Section 19. Effective date. This Act shall take effect upon its approval by the  
4 President, or upon its becoming law without such approval.

PASSED: October 17, 2006

Approved this 22<sup>ND</sup> day of OCTOBER, 2006.

  
\_\_\_\_\_  
Tommy E. Remengesau, Jr.  
President  
Republic of Palau



# **Aquaculture Information Package**

**July 2004**

**Provided by the Palau Aquaculture Stake Holders Group**





## Aquaculture Information Package

Starting a successful aquaculture venture requires three important steps: writing a sound business plan, fulfilling regulatory requirements, and obtaining funds. In order to guide you through this process, Palau's regulatory and business agencies have worked together to create this information packet.

This packet includes the following:

**Step-by-Step Flow Chart:** This chart advises you as to what order to visit the various agencies. It is best to start at the Small Business Development Center to receive counseling and advice on your business proposal before proceeding to the other agencies. The last step is to return to the Small Business Development Center to seek funding for your project.

**Aquaculture Preliminary Plan Questionnaire:** This document contains a series of questions that will help you determine some of the details of your plan, as well as guide regulatory agencies in determining what permitting requirements will apply to your specific project. If you need help filling out this form, the Ministry of Resources and Development can assist you. Once you have filled out this form, make appointments to visit the other agencies to discuss permit requirements. After fulfilling their requirements, a representative from each agency will sign the back of the form. This will help other agencies guide you through the remaining process, and help you keep a record of completed steps.

**Contact Information:** This sheet provides contact information for all pertinent agencies and states.

### Members of the Aquaculture Stake Holder's Group

- Bureau of Marine Resources
- Fish and Wildlife Protection
- Bureau of Agriculture
- Environmental Quality Protection Board (EQPB)
- Ministry of Resources and Development
- Office of Environmental Response (OERC)
- Palau Conservation Society
- Small Business Development Center
- Bureau of Arts and Culture
- National Development Bank of Palau
- Palau Community College Cooperative Research Extension (PCC-CRE)
- Bureau of Lands and Survey



The Palau Environmental Quality Protection Board (EQPB) is charged with promoting, protecting and preserving the Republic's environment, while, at the same time, providing for sound and sustainable economic and social development. Aquaculture projects have the potential to affect the surrounding environment both during construction as well as during operations, and hence several EQPB permits may be required. These permits include an Earthmoving Permit, a Toilet facilities Permit, a Point Source of Pollution Discharge Permit, and a Pesticide Application Permit.

The EQPB and the agency staff are committed to working closely with all applicants to ensure that environmental permitting requirements are thoroughly understood and to providing support in developing environmentally sound solutions that meet the project needs as well as satisfy regulatory requirements.

Attached the reader will find a list of relevant Permit application requirements. These requirements are based on Chapters 2401-1 (Earthmoving Regulations), 2401-11 (Marine and Fresh Water Quality), 2401-31 (Solid Waste Management), 2401-33 (Pesticide Regulations), 2401-61 (Environmental Impact Statements) of the Republic of Palau Environmental Quality Protection Board Regulations.

## General Discussion

Aquaculture projects must be planned, designed, constructed and operated correctly in order to succeed fiscally as well as mitigate potentially significant environmental impacts. Because their construction may affect the environment in different ways during different phases, more than one EQPB Permit may be required for an aquaculture project.

Many aquaculture projects will require an Environmental Assessment (EA) and, possibly, an Environmental Impact Statement (EIS). It is likely that the EA and EIS will contain most of information required for permitting that is outlined in this document.

### Construction Phase:

Construction of ponds, berms, and other related structures can cause severe negative impacts to the surrounding environment if not properly conducted. Siltation of reefs and mangroves from dredging and filling operations, as well as alteration of water flow such that areas are cut off from natural currents, resulting in oxygen deprivation to marine and mangrove plants and animals, are to be avoided as they can result in the death of these marine organisms. Careful planning and the use of mitigation measures such as silt curtains will allow for the construction of the facility without these negative impacts. An **earthmoving permit** will be required for these types of projects so that appropriate steps are taken to ensure that negative impacts are minimized.

### Operations Phase:

Operation of some aquaculture projects will result in the production of large volumes of waste, which must be disposed of in a manner such that the areas surrounding the facility are not polluted. Large numbers of fish in a confined area will produce higher than natural concentrations of fish excrement, and excess feed will also contribute the volume of waste produced. This waste presents the same potential problems as raw sewage, and its release without proper treatment is prohibited. Furthermore, although much of this waste will be suspended in water, a portion will continuously settle on the bottom of ponds, requiring that the ponds be cleaned out periodically. This resulting sludge must also be disposed of properly in order to avoid negative environmental impacts.

A **point source of pollution discharge permit**, and a **solid waste discharge permit**, are both required for these types of operations in order to ensure that the waste is properly treated and disposed of so that negative environmental impacts are avoided.

A **toilet facilities permit** will likely be required in order to ensure that the human waste produced by facility personnel is properly treated and disposed of as well.

### **Additional Comments on Permitting:**

Aquaculture operations take a variety of forms in terms of type of facility (open ocean pen, near shore ponds, landlocked ponds) as well as type of stock (fish, clams, shrimp, crabs) and whether the stock will be fed or not. The combination of each of these factors represents the unique characteristics of a proposed facility, along with its potential for environmental impacts. Permitting requirements for the various types of facilities will be tailored to each individual case, and therefore not all of the permits discussed above may be required for any particular operation. It should also be noted that potential environmental impacts of a proposed operation are proportional to the size of the facility; the larger the facility, the higher the potential for negative impacts. Permitting requirements will also be based on the size and scale of the proposed project, with larger operations requiring more in the way of planning and documentation.

### **Information Requirements for Permitting:**

The following pages describe generally the information that is required for the proper design and implementation of aquaculture projects in general. As stated above, not all proposed facilities will require the same information. The EQPB and other agencies will make a determination of the information requirements based on a conceptual description of the proposed project. For the purposes of this document, the term fish is used to denote any type of aquatic organism that is to be raised as stock, including fish, crabs, shrimp, lobsters, clams and sea cucumbers.

## **I. Construction of Facilities**

### **A. Plans and Drawings**

1. All plans, details and descriptions shall be in the English language and shall be to scale with the scale clearly denoted on the drawings themselves.
2. Site plans to include the following information:
  - a. Plan view of all areas where earthmoving is to be performed, including locations where fill material will be obtained or excavated material will be disposed of
  - b. The location of all Erosion and Sedimentation Control Measures (ESCM) will be shown on the site plan, with notation as appropriate to adequately convey information to the reviewer (see B.1 below)
  - c. Water flow characteristics of the surrounding area prior to construction of the facilities, based on observational data
  - d. Water flow characteristics of the surrounding area after construction of the facilities, based on engineering analysis
  - e. Plan view of all areas that will be affected by changes in the flow characteristics of surrounding waters that will result from the earthmoving operations
  - f. Plan view of all areas that could be affected by effluent discharge from the facility during operation
3. Facility plans to include the following information
  - a. All on-site facilities that will be utilized during construction
  - b. All on-site facilities that will be utilized during operation, including all water containment and water flow/circulation control structures
    - i. Show all water intake locations and flows
    - ii. Show all outfall locations and flows
  - c. The relationships between the various facilities (e.g. flow of water from one facility to another) shall be indicated on the drawings
  - d. The location of toilet facilities as well as plans and details describing the manner in which sewage will be disposed of
  - e. The location of solid waste storage areas

### **B. Supporting Information**

1. Erosion and Sedimentation Control Plan (ESCP)
  - a. The ESCP shall thoroughly describe all intended measures for elimination or mitigation of terrestrial and/or marine erosion and sedimentation
    - i. Silt fences, diversion berms, diversion channels, sediment basins, and other controls for terrestrial earthmoving
    - ii. Silt curtains and other controls for marine dredging/filling
  - b. Details and diagrams showing methods of installation and maintenance
  - c. Manufacturer's descriptions, cut sheets and samples as appropriate for proprietary products
2. Alternative Sites
  - a. List alternative site locations that have been considered for the aquaculture project
  - b. List the criteria for choosing the optimal site and describe the basis for choosing the selected site as compared to alternatives

## **II. Operation of Facilities**

### **A. Description of the stock to be raised at the facility**

1. Complete descriptions of all types of fish stock that will be raised in the facility throughout its operational life; note that Permit conditions will limit fish stock to those identified in the application
2. Identification of the stock as either native to the Republic or imported
  - a. If native, a complete description of the manner in which the seed stock will be obtained, including quantity of harvest and frequency
  - b. If imported, copies of approval documents for the importation of the fish from Marine Resources, Customs, and all other appropriate governmental authorities

### **B. Effluent discharge information**

1. Location, volume and frequency of discharge
  - a. Seasonal and other variations
2. Water flow line information
  - a. Complete diagram of water flow through facilities
  - b. Include all input and output
3. Sources of pollution in discharge
  - a. Process operations that contribute to pollution
  - b. Fish density, species, feeding parameters and procedures
  - c. Chemical additives for water quality and disease control
  - d. Best Management Practices (BMPs) and treatment technologies to remove or reduce pollutants before discharge, including the discharge of blood and fish carcasses associated with the transport and harvest of fish
4. Water quality of discharge
  - a. Identify and quantify (or estimate based on models, past experience) all expected pollutants in discharge
    - i. Nutrients, TSS, BOD, turbidity, DO content, chemical additives, phosphorus and nitrogen levels
    - ii. Identify the source of information
      1. Models
      2. Past experience with similar facilities in similar environments
      3. Supporting data analysis
  - b. Water quality monitoring programs
    - i. Location of sampling points
    - ii. Description of analyses to be performed
    - iii. Frequency
    - iv. Record keeping
  - c. Engineering reports on wastewater treatment
    - i. Include any technical evaluations that may exist regarding the proposed process and wastewater treatment procedures

### C. **Sludge Disposal**

1. Estimated volume and frequency of discharge
  - a. Seasonal and other variations
2. Sources of pollution in discharge
  - a. Process operations that contribute to pollution
  - b. Fish density and species information
  - c. Chemical additives for water quality and disease control
  - d. Best Management Practices (BMPs) and treatment technologies to remove or reduce pollutants before discharge
3. Method of removal of sludge from facilities
4. Method of disposal of sludge
  - a. Intended disposal site
    - i. Disposal must occur at a site with a valid EQPB permit allowing for such activity such as Malakal wastewater treatment plant or a permitted landfill; applicant to provide written permission from disposal site Permittee along with all conditions and requirements
    - ii. If applicant intends to dispose of sludge elsewhere, then an application for a **Solid Waste Disposal Permit** must be sought (contact EQPB for additional information on the requirements for this application)
    - iii. Describe any pre-treatment procedures (e.g. drying of sludge, treatment with chemical neutralizers) that are required and will be carried out prior to disposal

### D. **Solid Waste Disposal**

1. Estimate quantity of solid waste to be disposed of
2. Source and characteristics of solid waste
  - a. Include both organic and inorganic site
3. Method of transportation of disposal site
4. Identification of disposal site with valid EQPB permit
5. Applicant to provide written permission from disposal site Permittee along with all conditions and requirements

### E. **Mortality Removal**

1. Describe the collection of aquatic animal mortalities
2. Estimated the planned frequency of collections
3. Describe how mortalities will be stored and disposed of to prevent discharge into the waters of Palau

### F. **Drug and Chemical Additions**

1. Provide a list of all drugs and/or chemicals that will be used at the facility including, but not limited to, pesticides, herbicides, fungicides, antibiotics, and other medicines. For each, provide:
  - a. Product Name
  - b. Reason for use
2. Describe BMPs for monitoring additions of drugs and/or chemicals
3. Describe the proper storage of drugs and chemicals in order to avoid the inadvertent spillage or release into the aquatic animal production facility.

### **G. Fish Transfer Procedures**

1. Describe transfer procedures used during stocking and grading
2. If non-native species, describe in detail the precautions taken by the facility to prevent loss of non-native species. This description should include:
  - a. Schedule for preventative maintenance and inspection on the containment equipment
  - b. Fish transfer procedures during the stocking and grading
  - c. Escape recovery protocols

### **H. Fish Feeding**

- a. Describe type and frequency of feeding
- b. Describe BMPs for limiting the amount of unconsumed feed

### **I. Similar Projects**

1. Provide information on any existing aquaculture projects that are similar to the proposed project with regard to:
  - c. Production processes
  - d. Wastewater constituents, treatment and disposal
  - e. Sludge treatment and disposal

## **III. Qualifications and Experience**

### **A. Provide brief profile of company that will be tasked with constructing the facilities**

1. Provide the following information on the organization that will be tasked with planning, designing and operating the facilities (if different organizations will be used for the various phases, provide the following information on ALL organizations):
  - a. Name, contact personnel, contact information including email addresses
  - b. Qualifications of managing personnel, including technical background and experience
  - c. Overall qualifications, capabilities and experience of organization with regard to design and operation of aquaculture facilities similar to the proposed project in terms of
    - i. Size
    - ii. Stock type and population
    - iii. Production output
    - iv. Environmental setting

Note: lack of experience with similar aquaculture projects will not necessarily count against an organization; however, it will go to determining the extent of required information regarding the project as well as Permit conditions and requirements

2. Financial capabilities of operator
  - a. Provide estimate of total cost of construction facilities
  - b. Provide projection of operating costs per year for first ten years of operation
  - c. Provide projection of income per year for first ten years of operation
  - d. Provide name and contact information for all organizations responsible for financing the project during construction and operation
  - e. Provide proof of bonding, insurance or other means to finance mitigation efforts should environmental damage occur as a result of the construction or operation of the facilities
3. Describe the training to be provided for employees to ensure they understand the goals and objectives of the BMPs and their role in complying with them.



## Aquaculture Preliminary Plan Questionnaire

The questions below will help regulatory agencies determine what permitting and regulatory requirements will apply to your specific project. **Please fill out this questionnaire with the assistance of the Ministry of Resources and Development and then make an appointment to meet with appropriate agencies to discuss your aquaculture project.**

*Note: For the purposes of this document, the term fish is used to denote any type of aquatic organism that is to be raised as stock including fish, crabs, shrimp, lobsters, clams and sea cucumbers.*

1. Where are you building your aquaculture? \_\_\_\_\_  
\_\_\_\_\_

2. How will it be set-up?

|                                  |                                     |
|----------------------------------|-------------------------------------|
| _____ Open Ocean                 | _____ Inland Pond                   |
| _____ Mangrove                   | _____ Tanks                         |
| _____ Net Pen                    | _____ Other, please specify : _____ |
| _____ Pond Adjacent to the Ocean | _____                               |

3. What kind of construction or earthmoving will be required, if any?

\_\_\_\_\_  
\_\_\_\_\_

4. How will water flow through your aquaculture? \_\_\_\_\_  
\_\_\_\_\_

5. What species will you raise there?

|               |                                    |
|---------------|------------------------------------|
| _____ Clams   | _____ Crab                         |
| _____ Shrimp  | _____ Sea Cucumbers                |
| _____ Lobster | _____ Fish, specify species: _____ |
|               | _____ Other, please specify: _____ |

6. How many fish will you have? \_\_\_\_\_

7. How much sludge will the fish generate? \_\_\_\_\_

8. How will the sludge be disposed of? \_\_\_\_\_

**9. Where will the initial stock of fish come from?**

- \_\_\_\_\_ Mariculture, Marine Resources
- \_\_\_\_\_ Obtain from Reef
- \_\_\_\_\_ Imported from outside Republic
- \_\_\_\_\_ Other, please specify \_\_\_\_\_

**10. Do you plan to:**

- \_\_\_\_\_ Feed the fish
- \_\_\_\_\_ Apply pesticides
- \_\_\_\_\_ Use antibiotics
- \_\_\_\_\_ Apply any other chemical additives

**11. How often will you harvest the fish?** \_\_\_\_\_

**12. How will your population be maintained?**

- \_\_\_\_\_ Re-stock
- \_\_\_\_\_ Propagation/breeding
- \_\_\_\_\_ Other, please specify \_\_\_\_\_

**13. How will it be funded (state or private)?** \_\_\_\_\_

**14. Please list any experience or training you may have in aquaculture:**

\_\_\_\_\_

**15. Please list any consultants you have working with you on this project:**

\_\_\_\_\_

***After fulfilling each agency's requirements, have an authorized person from the agency sign the appropriate box below. In some instances there may be an initial and final review. Once all final reviews are complete, return to the Small Business Development Center for assistance in seeking funding.***

| Agency                            | Date of Initial Review and Authorizing Signature | Comments | Date of Final Review and Authorizing Signature |
|-----------------------------------|--------------------------------------------------|----------|------------------------------------------------|
| Bureau of Arts and Culture        |                                                  |          |                                                |
| State Government Office           |                                                  |          |                                                |
| Bureau of Marine Resources        |                                                  |          |                                                |
| Bureau of Lands and Survey        |                                                  |          |                                                |
| EQPB                              |                                                  |          |                                                |
| Small Business Development Center |                                                  |          |                                                |

**RPPL 6-42**  
**SIXTH OLBIL ERA KELULAU**

To amend Title 40 of the Palau National Code (PNC) by adding an entire new Chapter 25; to provide tax incentives for a limited time to encourage the development of sustainable agricultural, maricultural and aquacultural industries in the Republic; to set the terms under which such tax incentives may be offered and given; to provide for a “sunset date” on which such tax incentive programs will expire; and for other related purposes.

**AN ACT**

To amend Title 40 of the Palau National Code (PNC) by adding an entire new Chapter 25; to provide tax incentives for a limited time to encourage the development of sustainable agricultural, maricultural and aquacultural industries in the Republic; to set the terms under which such tax incentives may be offered and given; to provide for a “sunset date” on which such tax incentive programs will expire; and for other related purposes.

**THE PEOPLE OF PALAU REPRESENTED IN THE OLBIL ERA KELULAU DO ENACT AS FOLLOWS:**

**Section 1.** Legislative findings. Over the past several decades, the ability of the Republic of Palau to grow and produce its own food and to operate its own agricultural, maricultural, and aquacultural industry has declined. In order for Palau to maintain its independence from reliance on imported food and seafood products, it is necessary to reinvigorate and develop this industry. The Republic not only has the potential to meet its domestic needs, but can be expected in the future to develop sufficient capacity in such industries to export agricultural, maricultural, and aquacultural products to other nations. It is therefore important for the Republic of Palau to encourage investors to develop the agriculture, mariculture, and aquaculture industry in Palau by providing tax incentives.

Tax incentive programs, to be successful, must be focused on the specific goal of attracting quality investment, while recognizing that by granting some tax discounts or exemptions to private investors, the Republic will benefit economically through other means. It is further recognized that tax discounts or exemptions granted under a tax incentives program are not a loss in current revenue to the Republic, but represent a necessary stimulus to attract and encourage projects that promise substantial economic benefit for the Republic that would otherwise not be realized at all or would be lost to other nations. Therefore, it is appropriate and in the best interest of the Republic to establish a limited tax incentive program on an experimental basis for purposes of developing agriculture, mariculture, and aquaculture in the Republic.

**Section 2.** Amendments. A new chapter 25 is hereby added to Title 40 of the Palau National Code to provide as follows:

**CHAPTER 25**  
**TAX INCENTIVES FOR DEVELOPMENT OF AGRICULTURAL AND**  
**AQUACULTURAL INDUSTRIES IN PALAU**

**Section 2551. Purpose.** This chapter sets forth a program of tax incentives which may be offered for the purpose of developing sustainable agricultural, maricultural, and aquacultural projects which have been determined to be essential to the welfare of the Republic of Palau and its economy.

**Section 2552. Definitions.** For purposes of this chapter, the following definitions shall be used, unless the context indicates otherwise:

(a) “Agricultural project” includes any of the following:

(1) the operation of a facility for the breeding, raising, growing, or maintenance of livestock, poultry, pigs, or similar animal husbandry activities for the production of eggs, meat, milk, or other dairy products; or

(2) the raising, growing, or maintenance of vegetables, fruit, grains, or other plant products for food, medicinal, or other purposes, for sale, use, or consumption within the Republic or for export.

(b) “Aquacultural project or Maricultural project” includes the breeding, raising, growing, or maintenance within a confined or specifically designated area in either salt or fresh water of any fish stocks, clams, mollusks, crabs, shrimp, lobsters, sea cucumbers, sea weed, and other sea plants, for food, medicinal, or other purposes, or for aquarium purposes, for sale, use, or consumption within the Republic or for export.

**Section 2553. Operation of fishing vessels excluded.** For purposes of this chapter, the operation of a fishing vessel whether foreign or domestic, for purposes of catching fish and other sea products from the open sea or from an unconfined or non-designated area shall not be considered as an aquacultural or maricultural project eligible for the tax incentives offered herein.

**Section 2554. Tax incentives.**

(a) The following tax incentives may be offered to qualified agricultural, maricultural, and aquacultural projects with an investment value of not less than fifty thousand dollars (\$50,000.00):

(1) waiver of import taxes for a period not to exceed five years on: seeds; fertilizers; feed for poultry, hogs, and other livestock; insecticides or other pest control products; breeding stock; starter plants and stock; small hand tools; and other equipment used solely for the purpose of agricultural, maricultural, and aquacultural projects; for purposes of this chapter, equipment shall include but not be limited to tractors, chippers/shredders, and other similar machinery;

(2) application of a net income tax at the rate of four percent of net income in lieu of a gross revenue tax for a period not to exceed five years.

(b) No tax incentives shall be granted after January 1, 2008.

**Section 2555. Determination of qualification for tax incentives.** Tax incentives may be granted under this chapter only to qualified agricultural, maricultural, or aquacultural projects. A “qualified agricultural, maricultural, or aquacultural project” shall be one that meets the following criteria:

(a) the owner of the project must be a Palauan citizen or a domestic corporation chartered under the laws of the Republic;

(b) the project must involve the growing of crops, gardens, produce, livestock, poultry, fish, shellfish, or other agricultural, maricultural, or aquacultural products.

- (c) The project must be approved by the Bureau of Agriculture for agricultural projects and the Bureau of Marine Resources for aquacultural and maricultural projects, pursuant to regulations within 10 working days from the date of submission of an application;
- (d) Once a project has been approved, the relevant Bureau must provide technical assistance to help the project meet Environmental Quality Protection Board requirements and ensure the EQPB has the information required to issue the necessary permits within 60 days of application for the permit to the EQPB; and
- (e) The Environmental Quality Protection Board shall issue a permit for a qualified agriculture, mariculture and aquaculture project within 60 days of the project's application for the permit. The permit may set forth a schedule of conditions that must be met for the project to retain the permit.
- (f) The states of Ngiwal, Ngatpang, and Peleliu shall be deemed pilot project areas for the initial testing of the tax incentives program for aquaculture established by this Act. Accordingly, the Environmental Quality Protection Board shall grant permits within 30 days to all applicants for projects to be established in Ngiwal, Ngatpang, and Peleliu.

**Section 2556. Regulations.**

- (a) The Ministry of Resources and Development shall promulgate regulations consistent with this Act pursuant to the Administrative Procedure Act, PNC Chapter 1, as to the review and approval of qualified agricultural, maricultural, and aquacultural projects. Such regulations shall take into consideration the sustainability of the project in the future, the capacity of the project for future growth, and the resulting economic benefits to Palau and its citizens, within 90 days from the effective date of this act [sic].
- (b) The Bureau of Revenue, Customs and Taxation shall promulgate regulations consistent with this Act pursuant to the Administrative Procedure Act, PNC Chapter 1, concerning the exemption of eligible items from import taxes and the application of net income tax to qualified projects. In determining the "net income" of a qualified project, the owner of the project shall be entitled to deduct from gross revenue the entire amount paid in salaries to citizen employees, 50 percent of the amount paid in salaries to noncitizen employees, the cost of raw materials, such as seeds, fertilizer, and other items which are consumed or otherwise depleted during the course of the project, utility costs, and equipment costs used in the project.

**Section 2557. Tax incentives: licensing and issuance.** Pursuant to regulations, the Bureau of Agriculture shall issue a certificate to qualified agricultural, maricultural, or aquacultural projects which shall set forth the nature of the project and eligibility for waiver of import taxes or application of the net income tax or both. The time period for the tax waiver or reduction granted in the certificate shall commence on the date of the issuance of the certificate. A copy of the certificate shall be transmitted to the Bureau of Revenue, Customs and Taxation for use in determining exemption from import taxes and application of the net income tax. The certificate shall be renewable yearly up to a maximum of five years from the date of original issuance, subject to the limitations set forth in section 2554 of this chapter. The certificate shall be non-transferable and subject to cancellation or suspension by the Ministry of Resources and Development when the owner ceases to operate the project or substantially changes the nature of the project from that originally proposed to, and reviewed and approved by, the Bureau of Agriculture. The certificate may be suspended, canceled, or revoked by the Ministry of Resources and Development if the owner or the project is determined by a non-appealable order of the relevant administrative agency or the Supreme Court to have violated any applicable laws, rules, or regulations.

**Section 2558.** Same: not to be deemed right or privilege of the applicant. The grant of tax incentives pursuant to this Act is a concession offered by the Republic for the purpose of economic development and is reserved for projects of substantial economic benefit to the Republic. There shall be no right of appeal from a decision denying the grant of such tax incentives.

**Section 2559.** Same: limited purpose. The waiver of import taxes shall only be granted for those items listed in section 2554(a)(1) which are reasonably necessary for the conduct of the business or project. Regulations shall set forth the terms and conditions, consistent with section 2557, under which tax incentives may be revoked, suspended, or rescinded. Regulations shall set forth terms and conditions under which taxes waived by the Republic may be recouped in the event items treated as subject to the tax waiver or exemption are subsequently transferred to persons not entitled to such tax waiver or exemption or where such items are used in a manner not reasonably related to the business or project for which tax incentives have been granted. Items as to which the import tax has been waived shall not be transferred or sold within three years of importation to a person or party ineligible to receive such tax waiver without written consent of the Bureau of Revenue, Customs and Taxation. Regulations may provide that excess, used, or abandoned items may be sold or transferred to a person who otherwise is ineligible to receive tax benefits under this Act, provided that the applicable tax which was waived is paid by the seller prior to such sale or transfer.

**Section 2560.** Same: limitation on number issued. At no time shall the number of active tax incentive agreements issued exceed five (5) in number.

**Section 2561.** Sunset provision.

(a) This chapter [sic] shall expire January 1, 2008, unless otherwise extended by legislative act. Any tax incentives issued prior to, but which are still in effect as of January 1, 2008, shall be allowed to continue until their conclusion; however, no extensions may be granted thereafter.

(b) A report shall be made by the Ministry of Resources and Development to the President and the presiding officers of both houses of the Olbiil Era Kelulau on or before January 1, 2008, as to the impact this tax incentive program has had on agriculture, mariculture and aquaculture development in the Republic.”

Section 3. State governments exempt from import taxation. A state government is not a “person” subject to import taxation as that term is used in 40 PNC 1301(a).

Section 4. Effective date. This Act shall take effect upon its approval by the President of the Republic of Palau or upon its becoming law without such approval, or as otherwise provided by law.

**Passed: December 18, 2003**

**Approved this 5th day of January, 2004**

/s/

**Tommy E. Remengesau, Jr., President  
Republic of Palau**



# Koror State Government

P.O. Box 116  
KOROR, REPUBLIC OF PALAU 96940



**Department of Conservation  
and  
Law Enforcement**

Tel: 680 488 4001/8738 Main Office  
680 488 2150 Field Office  
Fax: 680 488 2862  
Email: [rica@kororstate.org](mailto:rica@kororstate.org) | [rorangers@palaunet.com](mailto:rorangers@palaunet.com)

## Rock Island Southern Lagoon Management Plan Taskforce Executive Committee 2011

1. Governor Yositaka Adachi, Koror State Government  
**Alternate:** Charlyne Uong, Chief Administrative Officer
2. Eyos Rudimch, Speaker- Legislator Iyebukel Hamlet, 9th Koror State Legislature
3. Franco Gibbons, Vice Speaker - Legislator At-Large, 9th Koror State Legislature
4. Jason Nolan - Legislator Medalaii Hamlet, Chairman Environment Committee,  
9th Koror State Legislature./Physical Therapy Supervisor, Ministry of Health.
5. Elia Yobech - Traditional Title : Chief Iyechadermai , Ngaramatel
6. Ernest Ongidobel- Traditional Title: Rechucher ra Ioulidid, House of Traditional  
Leaders
7. Isaias Oiterong, Director Department of Public Work, Koror State Government  
**Alternate:** Travis August, Technical Assistant Department of Public Work, Koror  
State Government
8. Gail Rengiil, Director, Treasury Department , Koror State Government  
**Alternate:** Joanne Nakamura, Human Resource Officer, Treasury Department,  
Koror State Government.
9. Scott Yano, Director , Department of Cultural Affairs, Koror State Government  
**Alternate :** Deborah Toribiong, Office Manager
10. Waisang Mariur, Ipang Seineng ra Oreor, Koror State Traditional Women's  
Group/Second Lady Republic of Palau.

Rock Island Southern Lagoon Management Plan Taskforce Executive Committee

11. Sunny O. Ngirmang, Ngara Maiberel ra Oreor, Koror State Traditional Women's Group/ National Registrar, Bureau of Arts and Culture
12. Ermas Ngiraelbad, Chairman Koror State Public Land and Authority Board, Koror State Government
13. Tutoud Ngiralmau - Vice Chairman, RISL Taskforce/Koror State Planning Commission, Koror State Government
14. Ilebrang Olkeriil, Director, Department of Conservation and Law Enforcement  
**Alternate:** King Sam, Rock Island Development Officer

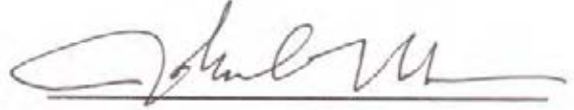


# Approval Page

This plan has been reviewed and approved by the  
Rock Island Management Area Executive Committee &  
Governor John Gibbons

June 2004

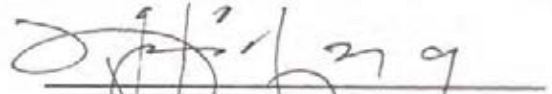
Governor John C. Gibbons



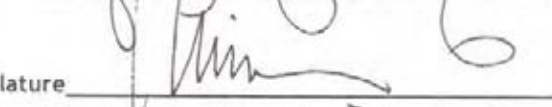
Rechucher Alex Merep, House of Traditional Leaders



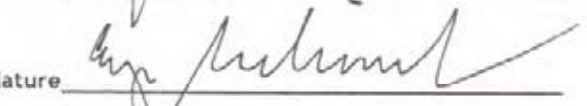
Balio Ngiraidong, Special Assistant, House of Traditional Leaders



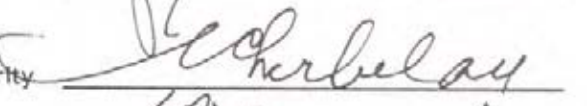
Millan Isack, Chairman Committee on Environment, Koror State Legislature



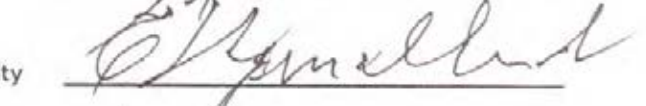
Eyos Rudimch, Chairman Committee on Tourism, Koror State Legislature



Viviana Ucherbelau, Board Member, Koror State Public Land Authority



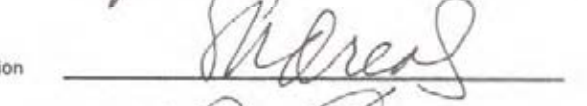
Ermas Ngiraelbaed, Board Member, Koror State Public Land Authority



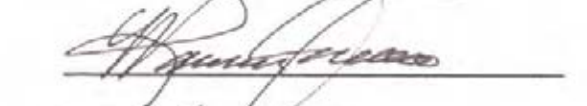
Tutoud Ngiralmu, Vice Chairman, Koror State Planning & Zoning Commission



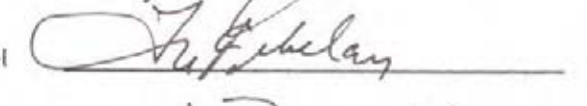
Sebastian Andreas, Board Member, Koror State Planning & Zoning Commission



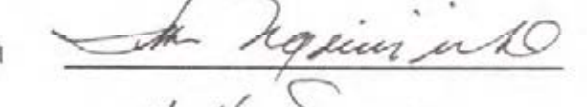
Roman Yano, Committee Chairman, Ngarametal Association



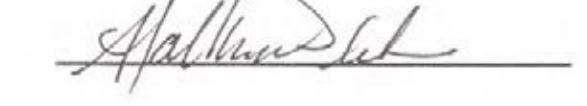
Florencia Elbelau, Koror Traditional Women's Group, Ngaramaiberel



Takeko Ngirairiki, Koror Traditional Women's Group, Ngaramaiberel



Adalbert Eledui, Director, Conservation & Law Enforcement



| NO. | Name                            | Zone                                  |
|-----|---------------------------------|---------------------------------------|
| 1   | Babelomekang Island and Beaches | Tourism zone                          |
| 2   | Ngemelis Island Reef            | Subsistence/Recreational Fishery Zone |
| 3   | Ngemelis Island Reef            | Conservation Zone                     |
| 4   | Ngemelis Island Reef            | Tourism zone                          |
| 5   | Clam City                       | Tourism zone                          |
| 6   | Soft Coral Arch                 | Tourism zone                          |

7 Cemetery Reef Tourism zone

8 Ngerkebesang Conservation Zone Conservation Zone

9 Ongeim'I Tketau(Jellyfish Lake) Tourism zone

10 Mandarin Fish Lake General Use Zone

11 Ioulomekang Island and Beaches Tourism zone

12 Sand flats, seagrass beds and coral reef areas ad Tourism zone

13 Ngeanges Island and beaches

Tourism zone

14 Ngchelobel Beach area

Tourism zone

15 Ngchus Island and Beaches

Tourism zone

16 Ngereblobang

Tourism zone

17 Bukl chotuut beach

Subsistence/Recreational Fishery Zone

18 Ngkesill Island Beach

General Use Zone

14 Dive/snorkel sites with a mooring buoy      Tourism zone

15 Ngeremdiu and the Ngeremdiu Todai Trail(Gerr Tourism zone

19 Ngerkebesang Conservation Zone      Conservation Zone

20 Ngederrak conservation area      Conservation Zone

21 Ngerumekaol Spawning area      Conservation Zone

22 Ngkisaol Islet      General Use Zone

23 Ngkisaol sardines sanctuary

Preservation Zone

24 Ngerukewid Islands Wildlife Preserve

Preservation Zone

Restrictions

no Subsistence/recreational harvesting  
no Commercial harvest

Allowed Activities

Entry to marine areas<sup>a</sup>  
Entry to land areas<sup>a</sup>  
Boating/kayaking  
SCUBA diving  
Snorkeling  
Personal Watercraft Use(jetskii etc.)<sup>e</sup>  
Monitoring/research activities<sup>h</sup>

no Commercial harvest  
no Personal Watercraft Use(jetskii etc.)

Entry to marine areas<sup>a</sup>  
Entry to land areas<sup>b</sup>  
Boating/kayaking  
SCUBA diving  
Snorkeling  
subsistence/recreational harvesting<sup>c</sup>  
Monitoring/research activities<sup>h</sup>

no Subsistence/recreational harvesting  
no Commercial harvest  
no Personal Watercraft Use(jetskii etc.)

Entry to marine areas<sup>a</sup>  
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Boating/kayaking  
SCUBA diving<sup>f</sup>  
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Monitoring/research activities<sup>h</sup>

no Subsistence/recreational harvesting  
no Commercial harvest

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SCUBA diving<sup>f</sup>  
Snorkeling<sup>f</sup>  
Monitoring/research activities<sup>h</sup>

no subsistence/recreational harvesting  
no commercial harvest

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Boating/kayaking  
SCUBA diving  
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Personal Watercraft Use(jetskii etc.)<sup>e</sup>  
Monitoring/research activities<sup>h</sup>

no Personal watercraft use(jetskills etc.)

Entry to marine areas<sup>a</sup>  
Entry to land areas<sup>b</sup>  
Boating/kayaking  
SCUBA diving  
Snorkeling  
subsistence/recreational harvesting<sup>c</sup>  
Monitoring/research activities<sup>h</sup>  
Commercial harvest

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no commercial harvest  
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no Personal watercraft use(jetskills etc.)

Entry to marine areas<sup>a</sup>  
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Boating/kayaking  
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subsistence/recreational harvesting<sup>c</sup>  
Monitoring/research activities<sup>h</sup>  
Commercial harvest

no Subsistence/recreational harvesting  
no Commercial harvest

Entry to marine areas<sup>a</sup>  
Entry to land areas<sup>a</sup>  
Boating/kayaking  
SCUBA diving  
Snorkeling  
Personal Watercraft Use(jetskii etc.)<sup>e</sup>  
Monitoring/research activities<sup>h</sup>

no Subsistence/recreational harvesting  
no Commercial harvest

Entry to marine areas<sup>a</sup>  
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Boating/kayaking  
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Monitoring/research activities<sup>h</sup>

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Entry to marine areas<sup>a</sup>  
Entry to land areas<sup>b</sup>  
Boating/kayaking  
SCUBA diving<sup>f</sup>  
Snorkeling<sup>f</sup>  
Monitoring/research activities<sup>h</sup>

no Personal watercraft use(jetskills etc.)

Entry to marine areas<sup>a</sup>  
Entry to land areas<sup>b</sup>  
Boating/kayaking  
SCUBA diving  
Snorkeling  
Subsistence/recreational harvesting<sup>c</sup>  
Monitoring/research activities<sup>h</sup>  
Commercial harvest

no Entry to marine areas<sup>g</sup>  
no Entry to land areas<sup>g</sup>  
no Boating/kayaking  
no SCUBA diving  
no Snorkeling  
no Subsistence/recreational harvesting  
no Commercial harvest  
no personal watercraft use(jetskills etc.)

Monitoring/research activities<sup>h</sup>

no Entry to marine areas<sup>g</sup>  
no Entry to land areas<sup>g</sup>  
no Boating/kayaking  
no SCUBA diving  
no Snorkeling  
no Subsistence/recreational harvesting  
no Commercial harvest  
no personal watercraft use(jetskills etc.)

Monitoring/research activities<sup>h</sup>

### Special Comments

- a Tourists require a valid Rock Island Permit
- b Entry is restricted to palau residents only
- c Non-Palau citizens require a non-commercial fishing licence
- d A commercial fishing licence is required
- e In designated water sport zones only
- f Tourists must be accompanied by certified tour-guide
- g Entry by approved operational staff on-duty state or national enforcement staff
- h With permit from both Koror State and National Government

**CONSERVATION AND LAW ENFORCEMENT**

Koror State Government Department of Conservation and Law Enforcement 2009-2011 Revenue and Expenditure

|                                  | <b>2009</b>            | <b>Actual<br/>2010</b> | <b>As of 11/29/11</b>  | <b>Projection<br/>2012</b> |
|----------------------------------|------------------------|------------------------|------------------------|----------------------------|
| <b>Revenue</b>                   |                        |                        |                        |                            |
| <b>(K8-180-2007)</b>             | <b>\$ 2,020,565.00</b> | <b>\$ 2,481,310.00</b> | <b>\$ 3,060,365.00</b> | <b>\$ 3,100,000.00</b>     |
| <b>Expenditures</b>              |                        |                        |                        |                            |
| Personnel Cost                   | 513,798.45             | 600,799.50             | 524,503.20             | 636,916.39                 |
| ICDF Volunteer Housing           | 7,800.00               | 9,425.00               | 3,990.00               | 10,000.00                  |
| Communication Equip. Purchase    | 4,101.55               | 1,820.30               | 1,238.95               | 26,700.00                  |
| Cap Asset (Boat)                 | -                      | 45,980.00              | -                      | 97,500.00                  |
| Vehicle Parts & Maintenance      | 3,096.60               | 3,393.95               | 2,893.29               | 5,000.00                   |
| Boat Parts & Maintenance         | 10,058.59              | 18,250.00              | 11,557.33              | 20,000.00                  |
| Ngemelis Security Outpost        | -                      | -                      | 6,673.60               | 15,000.00                  |
| Jellyfish Improvement            | -                      | -                      | 76.99                  | 25,000.00                  |
| Supplies (+3510)                 | 15,065.31              | 14,378.51              | 15,471.54              | 15,000.00                  |
| Uniforms & Accessories           | 3,632.54               | 1,574.07               | 1,283.09               | 5,000.00                   |
| Marine Buoys/Mapping/Signs       | 4,883.24               | 517.50                 | 1,154.96               | 10,000.00                  |
| POL - Fuel                       | 135,623.45             | 137,886.19             | 146,627.52             | 180,000.00                 |
| Contingency                      | 1,542.35               | 1,682.53               | 838.16                 | 2,500.00                   |
| Miscellaneous                    | 2,150.74               | 2,283.02               | 2,218.89               | 2,500.00                   |
| Staff Training                   | 2,946.99               | 2,975.54               | 4,784.13               | 15,000.00                  |
| Coastal Management               | 17,384.82              | 19,500.96              | 14,089.53              | 40,000.00                  |
| Donations/Contributions          | 320.90                 | 911.99                 | 606.05                 | -                          |
| Rock Island Southern Lagoon Mgmt | 1,315.94               | 2,063.47               | 2,310.71               | 80,000.00                  |
| Tour Guide Certificate Program   | -                      | -                      | -                      | 30,000.00                  |
| Improve Ranger's Office          | -                      | -                      | -                      | 23,500.00                  |
| Contractual/Education Awareness  | -                      | -                      | -                      | 30,000.00                  |
| Marine Sanctuary (ROC Grant)     | -                      | 4,483.71               | 5,421.79               | -                          |
| <b>Total Expenditures:</b>       | <b>\$ 723,721.47</b>   | <b>\$ 867,926.24</b>   | <b>\$ 745,739.73</b>   | <b>\$ 1,269,616.39</b>     |
| <b>Net income</b>                | <b>\$ 1,296,843.53</b> | <b>\$ 1,613,383.76</b> | <b>\$ 2,314,625.27</b> | <b>\$ 1,830,383.61</b>     |

Rangers

**A BILL FOR AN ACT**

To manage Koror's Rock Islands and water resources and to repeal KSPL No. K6-113-2000 ("Year 2000 Rock Islands Management and Conservation Act"), and the amendments thereto, KSPL No. K6-126-2001 and KSPL No. K8-180-2007, and for related purposes.

**THE PEOPLE OF KOROR REPRESENTED IN THE LEGISLATURE OF THE STATE OF KOROR DO ENACT AS FOLLOWS:**

**Section 1. Short title.**

2 This Act shall be known as the Rock Islands Management and Conservation Act.

3 **Section 2. Findings.**

4 The people of Koror represented by the Eighth Koror State Legislature find that because  
5 of recent court decisions, enforcement problems, and changes in national immigration policy and  
6 practices, it is necessary to revise The Year 2000 Rock Islands Management and Conservation  
7 Act, KSPL No. K6-113-2000, and the amendments thereto, KSPL No. K6-126-2001 and KSPL  
8 No. K8-180-2007, in order to clarify certain terms, provisions, and requirements of the Act and  
9 to facilitate the fair and equitable enforcement of the Act for the benefit of the Rock Islands and  
10 the people of Koror.

11 **Section 3. Definitions.**

12 (a) Rock Islands. This term shall refer to all islands, including the land and beaches  
13 within the territorial jurisdiction of the State of Koror unless otherwise excepted. For purpose  
14 of this Act, "Rock Islands" does not include the island of Malakal, Arkebesang, Ngerur Island,  
15 Koror Mainland and any other small islets or islands joined to Malakal, Arkebesang or Koror  
16 Mainland by causeway or bridge.

17 (b) Koror Mainland. Koror Mainland includes the entire island of Koror, but does not  
18 include the area known as Ngermeuangel.

19 (c) Palauan Citizen. Any person who is citizen of Palau under national law.

20 (d) Resident Alien. Any person who is not a citizen of Palau but who resides in Palau.

21 For purposes of this Act, a person resides in Palau when they are physically present in Palau with  
22 the intent to remain for a period in excess of ninety consecutive days as evidenced by a current

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1 visa authorizing entry into Palau for a period in excess of ninety days or United States Military  
2 Orders authorizing entry in to Palau for a period in excess of ninety days.

3 (e) Visitor. Any person who is not a Palauan Citizen or a Resident Alien as defined in  
4 this Act.

5 (f) Tourist Activity Areas. Tourist Activity Areas are designated areas where Visitors are  
6 permitted to enter upon, stay or visit, provided they are in possession of a valid use permit. The  
7 following areas, shown on the attached map, are hereby designated as Tourist Activity Areas:

- 8 1. The jellyfish lake on the island of Macharchar, including the designated pathway  
9 leading to the lake;
- 10 2. The island of Babelomekang;
- 11 3. The island of Youlomekang;
- 12 4. The beach area of Ngchelobel;
- 13 5. The island of Ngeanges;
- 14 6. The island of Ngermeaus;
- 15 7. The beach area of Ngchus;
- 16 8. Ngeremdiu and the Ngeremdiu Todai Trail (German Lighthouse);
- 17 9. The island of Ulong;
- 18 10. The beach area of Ngeroblobang;
- 19 1. Bkulotuut; and
- 20 12. The Ngemelis Island Group, but only the islands of Dmasech, Uchul A Rois (also  
21 known as Arimasuku), Iilblau, Cheleu, and Bailechesngel.

22 (g) Diver. Any Visitor, as defined by this Act, who dives in the waters of Koror using a  
23 self-contained breathing apparatus.

24 (h) Tour Operator. Any entity, whether individual, partnership, corporation, non-profit  
25 group, joint venture, or other organization, that is engaged in the business of providing  
26 recreational activities to Visitors in Palau.

27 (i) Boat Operator. Any person who physically transports any Visitor to go scuba diving,

1 to enter into a Tourist Activity Area, or to engage in any other recreational activity in the waters  
2 of Koror.

3 (j) Tour Guide. The person primarily responsible for a Visitor or group of Visitors who  
4 go scuba diving, enter into a Tourist Activity Area, or engage in any other recreational activity  
5 in the waters of Koror.

6 (k) Valid Rock Island Use Permit. A Rock Island Use Permit, issued by Koror State or  
7 its agents, that has been originally issued to one person in their name, has not been transferred,  
8 and has been fully paid in advance.

9 (l) Jellyfish Lake. The jellyfish lake on the island of Macharchar, also known as Ongeim  
10 L'tketau, including the designated pathway to the lake.

11 (m) Valid Jellyfish Lake Permit. A Jellyfish Lake permit issued by Koror State that has  
12 originally been issued to one person in their name, which is paid in advance, and which is not  
13 transferable.

14 (n) Waters of Koror. All waters within the territorial jurisdiction of Koror State including  
15 waters from the land of Koror State to twelve nautical miles seaward from the traditional  
16 baseline.

17 (o) Official guests. Ambassadors and diplomatic corps or staff, foreign dignitaries who  
18 are in Palau on official business, foreign government officials and representatives, representatives  
19 of religious, scientific, educational, or charitable non-profit organizations, and any other official  
20 representatives in Palau to meet with national or state government officials, to participate in an  
21 official seminar or conference, or to participate in athletic or educational competitions.

22 **Section 4. Areas reserved for Palauan Citizens and Resident Aliens.**

23 A. All rock islands within the territorial boundaries of Koror not designated as Tourist  
24 Activity Areas are reserved for the exclusive use of Palauan Citizens and Resident Aliens.  
25 Visitors may not enter, visit, stay or remain on any rock island or portion thereof that has not  
26 been designated as a Tourist Activity Area.

27 B. It shall be unlawful for any person to aid, abet, assist, guide or transport any Visitor



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1 into or on any rock island or portion thereof that has not been designated as a Tourist Activity  
2 Area.

3 C. It shall be unlawful for any Tour Operator to aid, abet, assist, guide or transport any  
4 Visitor into or on any rock island or portion thereof that has not been designated as a Tourist  
5 Activity Area.

6 **Section 5. Areas Open to Visitors.**

7 A. Visitors may enter, visit, stay or remain on any area specifically designated as a  
8 Tourist Activity Area provided they have in their possession or control a valid Jellyfish Lake  
9 Permit. Visitors may enter, visit, stay or remain on any area specifically designated as a Tourist  
10 Activity Area, with the exception of Jellyfish Lake, provided they have in their possession or  
11 control a valid Rock Island Use Permit.

12 B. No portion of this Act shall be construed to prohibit Visitors from utilizing the waters  
13 of Koror for the uses set forth in Section 6, provided they have purchased and hold in their  
14 possession or control a valid Rock Island Use Permit or Jellyfish Lake Permit.

15 **Section 6. Rock Island Use Permits; Jellyfish Lake Permits; Activities Requiring Permits;**  
16 **Exception for Direct, Non-Stop Transit; Prohibitions.**

17 A. A Rock Island Use Permit must be purchased by a Visitor to engage in any of the  
18 following activities in or on the waters of Koror:

- 19 1. scuba diving;
- 20 2. any other recreational activity, including but not limited to, snorkeling,  
21 swimming, fishing, boating of any kind, boat touring, water skiing, use of personal  
22 watercraft, and kayaking; and
- 23 3. entry into and use of any designated Tourist Activity Area, with the exception  
24 of Jellyfish Lake.

25 B. A Visitor who wishes to visit Jellyfish Lake must purchase a Jellyfish Lake Permit.  
26 Possession of a valid Jellyfish permit grants the Visitor all of the privileges of a Rock Island Use  
27 Permit, as well as access to Jellyfish Lake.

1 C. This Act does not exempt a Visitor from any law requiring a person to obtain a fishing  
2 permit. Visitors who engage in fishing activities must also obtain a Fishing Permit as required  
3 under separate law.

4 D. Visitors, while in direct, non-stop transit through the waters of Koror, whose  
5 destination is outside the boundaries of Koror, and who do not engage in any of the above  
6 activities, are not required to obtain a Rock Island Use Permit or Jellyfish Lake Permit.

7 E. It shall be unlawful for any Visitor to engage in any of the activities listed in section  
8 6.A. or to enter a Tourist Activity Area without a valid permit as required by this Act.

9 F. It shall be unlawful for any person to aid, abet, assist, guide or transport any Visitor,  
10 without a valid permit as required by this Act, to engage in any of the activities listed in section  
11 6.A or to enter a Tourist Activity Area.

12 G. It shall be unlawful for any Tour Operator to aid, abet, assist, guide or transport any  
13 Visitor, without a valid permit as required by this Act, to engage in any of the activities listed in  
14 section 6.A or to enter a Tourist Activity Area.

15 **Section 7. Permits; Purchase, Expiration Date and Conditions of Use.**

16 A. A Rock Island Use Permit must be purchased for a fee of \$25.00 for all Visitors who  
17 are six (6) years old and older. A Jellyfish Lake permit must be purchased for a fee of \$35.00 for  
18 all Visitors who are six (6) years old and older. Permits are valid for ten (10) days and are not  
19 transferable. Permits shall be available for purchase from the Koror State Finance Office or  
20 designated agents.

21 B. Each permit issued to a Visitor shall be sequentially numbered and shall set forth the  
22 name of the Visitor, the signature of the Visitor, the expiration date of the permit, the name of  
23 the Tour Operator, if any, responsible for the Visitor, and the amount of the fee paid. At the time  
24 permit is issued, the Visitor must print their name and sign the permit. A permit that does not  
25 contain the name and signature of the Visitor is not valid. It shall be unlawful to transfer,  
26 counterfeit, duplicate, forge, alter, or create a permit, and only a valid permit issued by the State  
27 of Koror shall be lawful.

1 C. Permits must be kept in the Visitor's possession or control at all times, except that a  
2 Tour Guide or Boat Operator may hold or control the permit for the Visitor while the Visitor is  
3 engaged in recreational activities. Permits must be made available for inspection by Koror State  
4 law enforcement personnel upon demand. Koror State Government shall post a person at or near  
5 the Jellyfish Lake docking facility to inspect Jellyfish Lake permits and to insure compliance with  
6 this Act.

7 D. There is hereby created an exemption from the permit requirement for all persons who  
8 attend the Dolphin Pacific training, educational, and research facility in Malakal Harbor. No  
9 such persons shall be required to obtain a permit to attend the permanent facility in Malakal  
10 Harbor; provided however, that any such person shall be required to obtain a permit for all other  
11 areas as required by this Act.

12 **Section 8. Tour Operators Selling Permits.**

13 Tour Operators may be authorized by the Koror State Governor to sell permits to their  
14 customers under the conditions set forth below:

15 1. Tour Operators must apply to the Governor for the privilege to sell permits to their  
16 customers. The determination of whether to allow Tour Operators to sell permits to Visitors is  
17 within the discretion of the Governor, or his designated representative. Applications shall be  
18 available from the Koror State Finance Office and shall include the following: (1) the Tour  
19 Operator's name, mailing address, phone number and location of business; (2) the name and  
20 address of the persons employed by the Tour Operator who will be permitted to sell permits on  
21 behalf of the Tour Operator; (3) a signed, sworn statement by an authorized agent for the Tour  
22 Operator that, in issuing the permits, the Tour Operator will collect the required fee for each  
23 person who requires a permit.

24 2. The Governor has the right to revoke a Tour Operator's privilege to sell permits if the  
25 Governor determines, in his sole discretion, that the Tour Operator is not issuing permits in strict  
26 accordance with this Act, or that the Tour Operator has failed to follow any of the requirements  
27 of this Act.

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3. Tour Operators who have been authorized to sell permits must purchase, in advance, serially numbered blank permits from the Koror State Finance Office during regularly scheduled office hours.

4. Tour Operators are required to maintain a detailed accounting with regard to the permits sold. The accounting must contain the following information: (1) name and address of the Visitor; (2) serial number of permit issued to that Visitor; (3) date of issuance; (4) Koror State receipt number.

5. Tour Operators shall submit the accounting to the Koror State Finance Office for the quarterly periods as follows: January 1, through March 31; April 1 through June 30; July 1 through September 30; October 1 through December 31. Such an accounting must be received at the Koror State Finance Office on the 15<sup>th</sup> day of the month following the end of a quarter. Failure to submit a timely accounting will result in the revocation of the privilege to sell permits to customers.

6. Tour Operators are required to make Visitors aware of the prohibitions and restrictions of the Rock Island Management and Conservation Act.

7. Tour Operators are required to post a notice at their operating site that contains the following: "NOTICE: ALL VISITORS ARE REQUIRED TO PURCHASE A PERMIT AND PAY A USER FEE OF \$25.00 BEFORE THEY WILL BE PERMITTED TO ENJOY THE WATERS AND ISLANDS OF KOROR. A SEPARATE PERMIT AND THE PAYMENT OF A \$35.00 FEE IS REQUIRED TO ENTER JELLYFISH LAKE. IT IS YOUR RESPONSIBILITY TO MAKE SURE YOU HAVE BEEN ISSUED A VALID PERMIT FROM THE TOUR OPERATOR. THE PERMIT MUST BE IN YOUR POSSESSION OR CONTROL AT ALL TIMES."

8. The notice shall be located in a conspicuous place, shall be of a size greater than 8 and ½ by 11 inches and shall be in bold print. If the Tour Operator conducts business on a regular basis with Visitors speaking languages other than English, the Tour Operator is also required to post the notice in that language. Failure to post the notice is a violation of this Act.

1           9. The Koror State Finance Office may conduct an audit of permits sold by Tour  
2 Operators at any time upon reasonable notice to the Tour Operator. Upon written request by the  
3 Koror State Finance Office or its authorized agent for an audit, a Tour Operator shall allow  
4 inspection of records pertaining to the sale of permits at the Tour Operator's regular place of  
5 business during regular working hours. It shall be a violation of this Act for a Tour Operator to  
6 prohibit, refuse or cause delay in allowing the Koror State Finance Office or its authorized agent  
7 to conduct an audit and to inspect and copy pertinent records. A violation under this section  
8 exists each day that an audit cannot be conducted and every day of such conduct constitutes a  
9 separate offense. Koror State may revoke the right or privilege of a Tour Operator to sell permits  
10 if the Tour Operator has violated the provisions of this Act, if the Tour Operator delays or fails  
11 to allow an audit as called for by this Act, or if the Tour Operator does not maintain adequate or  
12 proper records to allow for a proper audit by Koror State, or if the Tour Operator cannot account  
13 for all permits purchased.

14       **Section 9. Special Grants of Exemption.**

15           A. The Governor, or his designee, may, in his discretion, provide a special grant of  
16 exemption from the requirements of this Act for Official Guests. Palauans and Resident Aliens  
17 may also be exempted by the Governor, or his designee, for the specific purpose of transporting  
18 or accompanying such Official Guests to such areas. Such grant of exemption shall be in writing  
19 identifying the persons and dates of exemption, and shall be carried with the Official Guests at  
20 all times while in the Rock Islands.

21           B. The Governor, or his designee, may, in his discretion, provide a special grant of  
22 exemption from the requirements of this Act for persons involved in any scientific, educational,  
23 or environmental activity. Palauans and Resident Aliens may also be exempted by the Governor,  
24 or his designee, for the specific purpose of transporting or accompanying such persons to such  
25 areas. Such grant of exemption shall be in writing identifying the persons and dates of  
26 exemption, and shall be carried with the persons at all times while in the Rock Islands.

27       **Section 10. Prohibition to Entry to Other Jellyfish Lakes.**

1           A. It shall be unlawful to enter or to come within two-hundred feet (200') of any other  
2 marine lake with jellyfish in Koror. "Marine Lake" means any body of water that contains salt  
3 water, and which appears to be landlocked, but which is connected to the sea by fissures, cracks,  
4 caves, or tunnels.

5           B. It shall be unlawful to aid, abet, encourage, assist, guide, escort, or otherwise take any  
6 person to any jellyfish lake in violation of the prohibitions of this section.

7           C. The Governor may provide a written exemption from the prohibitions of this section  
8 for any scientific, educational, or environmental activity, or to any other person in the discretion  
9 of the Governor. The exemption shall state the name of the persons exempted and the dates of  
10 exemption.

11 **Section 11. Prohibitions While in Jellyfish Lake.**

12           A. It shall be unlawful to take, remove, capture, or otherwise possess any marine life,  
13 including but not limited to jellyfish, from any jellyfish lake.

14           B. It shall be unlawful to wear gloves while in any jellyfish lake.

15           C. It shall be unlawful to bring any living or non-living organism into any jellyfish lake,  
16 and no living or non-living organisms may be introduced or otherwise released into any jellyfish  
17 lake. This prohibition includes, shells, corals, rocks, fish, crabs, vertebrates, invertebrates, and  
18 pieces of any organism, living or dead.

19           D. The prohibitions of this section apply to the jellyfish lake on Mecherchar Island, the  
20 jellyfish lake on Ngermeuangel Island, and to any other marine lake with jellyfish.

21           E. It shall be unlawful to aid, abet, encourage, assist, guide, escort, or otherwise take any  
22 person to any jellyfish lake in violation of the prohibitions of this section.

23           F. The Governor may provide a written exemption from the prohibitions of this section  
24 for any scientific, educational, or environmental activity, or to any other person in the discretion  
25 of the Governor. The exemption shall state the name of the persons exempted and the dates of  
26 exemption.

27 **Section 12. Proof of Identification; Passenger Lists.**

1           A. All persons present in the Rock Islands and/or the waters of Koror are under an  
2 affirmative duty to identify themselves if requested to do so by Koror State law enforcement  
3 personnel. Such identification shall include the person's full name, their status as either a Palauan  
4 Citizen, a Resident Alien, or a Visitor to Palau, their address in Palau, and their country of origin  
5 and date of arrival and departure if a Visitor to Palau. Failure to provide this information is a  
6 violation of this Act.

7           B. Resident Aliens must have in their possession written proof of identification to engage  
8 in any of the activities listed in section 6.A. or to visit any of the Rock Islands, and must provide  
9 this proof of identification for inspection by Koror State law enforcement personnel upon request.  
10 Failure to provide proof of identification establishes the presumption that the person is a Visitor  
11 and will subject the person to the same requirements and penalties that apply to Visitors under this  
12 Act. Written proof of identification may be satisfied by a current visa authorizing entry into  
13 Palau for a period in excess of ninety days or a current "Resident Identification Card" as described  
14 in Section 13.

15           C. All Boat Operators must maintain in their possession a passenger list of all Visitors  
16 that they are transporting to engage in any of the activities listed in section 6.A or to enter a  
17 Tourist Activity Area, and must provide this list for inspection upon the request of Koror State  
18 law enforcement personnel. This list shall include the name of each Visitor, the Visitor's country  
19 of origin, and the Visitor's date of arrival and departure. Failure to provide said list for inspection  
20 is a violation of this Act.

21 **Section 13. Resident Identification Card.**

22           A. In order to satisfy the requirement of possession of written proof of identification, a  
23 Resident Alien may purchase a "Resident Identification Card" from Koror State. To purchase  
24 this card the Resident Alien must bring to the Koror State Finance Office a current passport and  
25 visa authorizing entry into Palau for a period in excess of ninety days or United States military  
26 orders authorizing entry into Palau for a period in excess of ninety days. In addition, the Resident  
27 Alien must bring a current one square inch color photograph. The price of the card shall be \$5.00.

1

2

B. The Resident Identification Card shall contain the following: the resident's name, the resident's signature, a current color photograph of the resident, and the date of expiration of the card. The date of expiration of the card shall be the date of expiration of the resident's visa. Future revisions of the card, including price, may be determined by the Governor of Koror State, or his designated representative.

7

C. The Koror State Finance Office shall maintain a list of all Resident Identification Cards issued. The list shall include the name of the Resident Alien, the expiration date of the card, and the date the card was issued.

10

D. It shall be unlawful to transfer, counterfeit, duplicate, forge, or alter a Resident Identification Card.

12

**Section 14. Penalties.**

13

A. Each violation of this Act is punishable by a fine of \$100.00 and up ninety days in jail. Each violation of this Act is a separate offense which may be punished separately. For example, if a tour guide were to transport ten Visitors to Jellyfish Lake without valid permits, the tour guide would have committed ten separate violations, each punishable by a fine of \$100.00 and up to ninety days in jail.

18

B. The permits required by this Act allow Visitors to enjoy the privilege of visiting the Rock Islands and Jellyfish Lake. The Governor, or his designated representative, may refuse to sell permits to any Tour Operator or to any persons who have violated the provisions of this Act.

21

**Section 15. Use of Revenues; Date of Termination of Permit Fees.**

22

A. Fees generated from this Act shall be used:

23

(1) To enforce compliance with this Act, including purchase of fuel and oil, boats and boating equipment, and to pay salaries, wages and compensation, along with other enforcement expenses;

25

(2) To maintain and protect the rock islands, including maintenance and grounds keeping, construction of improvements and facilities for tourists and conservation activities;

27

(3) To maintain and protect diving sites;



- 1 (4) To acquire and install mooring buoys at appropriate locations;
- 2 (5) For monitoring purposes and for other expenses associated with the protection and
- 3 preservation of Koror's rock islands;
- 4 (6) To pay for personnel to monitor entry into the Jellyfish Lake;
- 5 (7) To pay for scientific studies, technical assistance, and equipment to monitor or study Jellyfish
- 6 Lake and other marine lakes, and to take action to conserve, preserve and protect the Jellyfish
- 7 Lake and other marine lakes, including expenses for the removal of invasive or on-native species
- 8 in Jellyfish Lake and other marine lakes;
- 9 (8) To make improvements to docks, trails, access, and other facilities;
- 10 (9) To pay for education, interpretive materials, permits, and other materials needed to allow the
- 11 Governor to implement this Act.

12 B. Other fees generated by this Act may be used to compensate the people of Koror for

13 the impacts associated with this Act pursuant to the directives of the Governor.

14 C. The fees generated by this Act shall be collected for ten years from the date of this Act.

15 **Section 16. Authority to Promulgate Regulations.**

16 The Governor of Koror State, or his designated representative, is hereby authorized to

17 promulgate regulations to implement and enforce this Act. Said regulations shall have the force

18 and effect of law.

19 **Section 17. Authority for Enforcement.**

20 Koror State law enforcement personnel, also known as the Koror State Rangers, shall have

21 the authority to enforce the provisions of this Act, including the authority to issue citations for

22 violations thereof.

23 **Section 18. Repealer.**

24 The following Koror State Public Laws are repealed in their entirety: KSPL No. K6-113-

25 2000 (Year 2000 Rock Islands Management and Conservation Act), and the amendments thereto,

26 KSPL No. K6-126-2001 and KSPL No. K8-180-2007.

27 **Section 19. Severability.**

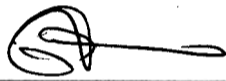
1           If a court of competent jurisdiction determines that any portion or portions of this Act are  
 2           invalid, then such offending portion or portions shall be stricken, but the remainder of this Act  
 3           shall continue in full force and effect.

4           **Section 20. Effective date.**

5           This Act shall take effect upon its becoming law as provided in the Koror State  
 6           Constitution. It shall become enforceable on the day it becomes law, with the exception of the  
 7           requirements of Section 12 which shall become enforceable sixty days thereafter.

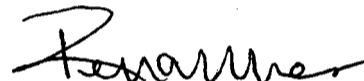
**PASSED ON : MARCH 12, 2009**

**CERTIFIED BY:**



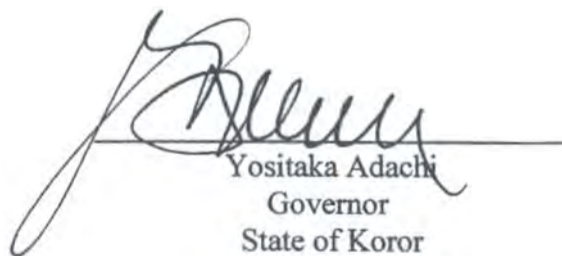
\_\_\_\_\_  
 Timothy "Tero" Uehara  
 Speaker  
 Eighth Koror State Legislature

**ATTESTED TO BY:**

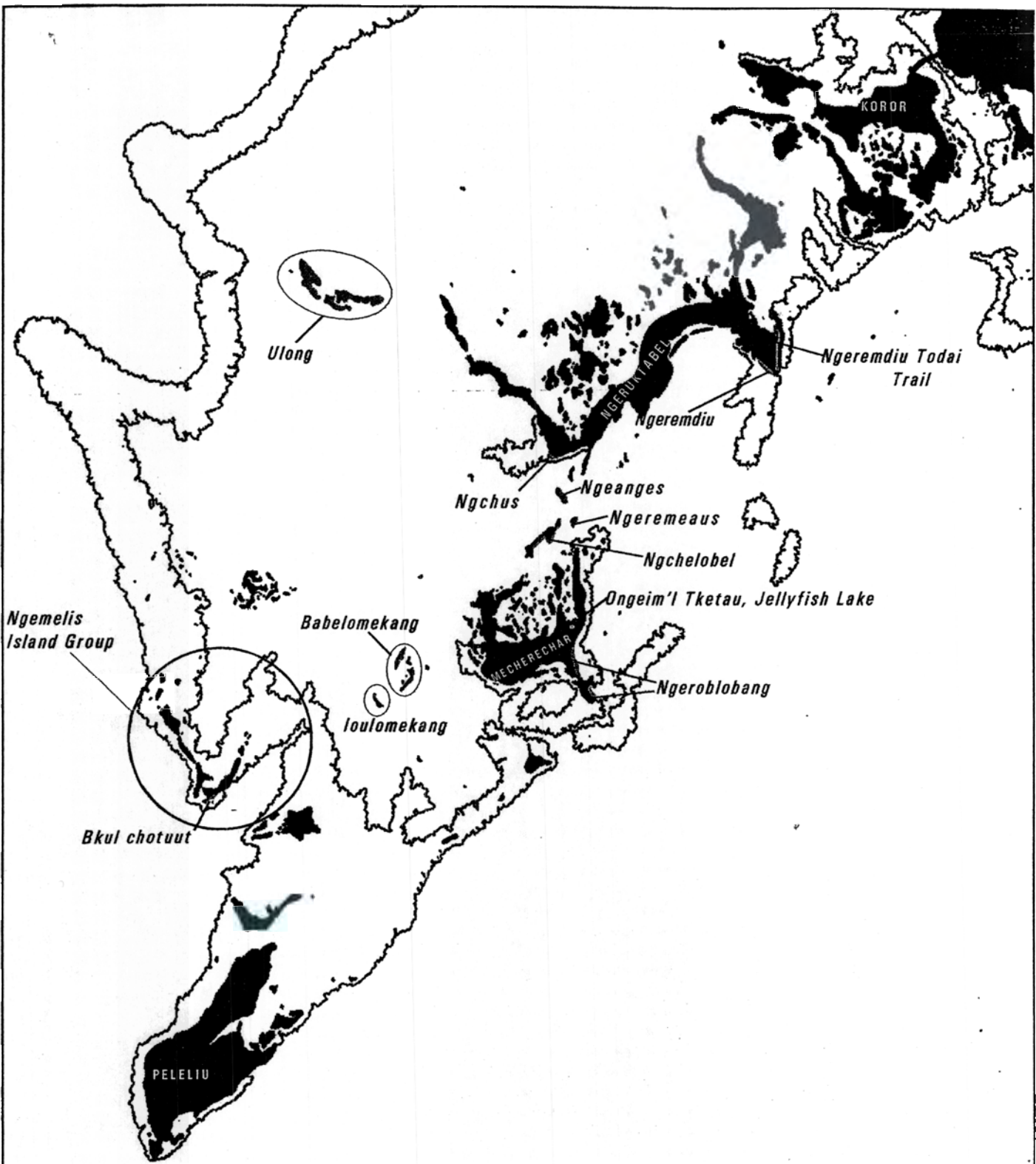


\_\_\_\_\_  
 Rena Iluches  
 Clerk  
 Eighth Koror State Legislature

APPROVED ON THIS 23<sup>rd</sup> DAY OF March, 2009



\_\_\_\_\_  
 Yositaka Adachi  
 Governor  
 State of Koror



**Designated Tourist Activity Areas**  
**Rock Islands Management and Conservation Act**

*Ranga*

**AN ACT**

To repeal section "2.B." of KSPL No. K7-132-2002 relating to Long Island Park, to create a conservation area consisting of Long Island Park and the adjoining rock island, to provide for development for public benefit, to provide penalties for violations of this Act and regulations promulgated under this Act, and for related purposes.

**THE PEOPLE OF KOROR REPRESENTED IN THE LEGISLATURE OF THE STATE OF KOROR DO ENACT AS FOLLOWS:**

1           **Section 1. Findings.** The Ninth Koror State Legislature hereby finds that Long Island Park  
2 has received designation as a Koror State Park in KSPL No. K7-132-2002, but there is no  
3 comprehensive legislation relating to the preservation or development of the area, and the area  
4 deserves to be enlarged. It is in the best interests of the people of the State of Koror to designate as  
5 a State Park the entire rock island adjoining Long Island Park, along with Long Island Park, for  
6 natural preservation and recreational activities.

7           **Section 2. Amendment of sections "1" and "2" of KSPL No. K7-132-2002 to delete**  
8 **references to Long Island Park.** Sections "1" and "2" of KSPL No. K7-132-2002 are hereby  
9 amended to delete references to Long Island Park, as follows:

10                           "SECTION 1. FINDINGS. The Seventh Koror State Legislature  
11 hereby finds that there is a limited number of parks and recreation areas in  
12 Koror for use by tourists and the people of Palau, and that it is in the  
13 interests of the people of the State of Koror for the State Government to  
14 provide aesthetically pleasing open spaces with ocean access for various  
15 forms of recreation.

16                           The Seventh Koror State Legislature further finds that the  
17 Japan-Palau Friendship Bridge, formerly known as the "K-B Bridge", has  
18 been successfully completed, and the area below the bridge on the Koror  
19 side has a basketball court and is ideal for swimming and other forms of  
20 water recreation.

21                           It will also serve the interests of the people to limit or prevent  
22 commercial uses and development in the Koror State Park areas until plans

1 have been finalized for all potential and actual development of the Park  
2 areas.

3 The Seventh Koror State Legislature finds that it is in the best  
4 interests of the people of the State of Koror to designate, establish, and  
5 maintain an official State park that will allow public access to the ocean  
6 areas under the Japan-Palau Friendship Bridge. The establishment and  
7 maintenance of these areas as official State parks will benefit Palauans and  
8 visitors alike.

9 SECTION 2. STATE PARKS DESIGNATED AND  
10 ESTABLISHED.

11 A. There is hereby designated and established an official Koror  
12 State park under the Japan-Palau Friendship Bridge on the Koror side of the  
13 bridge. The State of Koror shall develop and maintain recreational facilities  
14 and make other improvements for the use and enjoyment of the park by the  
15 people of Palau and visitors to Palau. Koror State Government shall take  
16 active steps to promulgate plans for the development of the park area,  
17 including facilities such as a community center, playgrounds, beach and  
18 docking areas, picnicking and cooking areas, and other recreational  
19 facilities.

20 B. Until such time as a comprehensive plan is developed for the  
21 improvement of the property under the bridge, and until this section is  
22 repealed, there shall be no commercial development or commercial uses or  
23 other commercial activity on or in the park areas designated and established  
24 by this Act. The prohibition against commercial development or uses shall  
25 not include the installation or construction of any infrastructure such as  
26 water and electrical services.

27 C. Within sixty (60) days of the effective date of this Act, the  
28 Governor shall promulgate regulations relating to the use of the Parks



1 designated or established under this Act, including regulations relating to  
2 the hours that the Parks may remain open, reservation of Park facilities for  
3 use by groups or individuals, issuance of permits for uses of Park facilities,  
4 and collection of fees for uses of buildings or other facilities. Koror State  
5 Government shall be responsible for maintaining the Parks, including  
6 trimming or removal of grass and vegetation, painting and renovation of  
7 existing facilities as necessary, providing trash receptacles, and removal of  
8 trash and debris.”

9 **Section 3. “Long Island Park and Conservation Area” established.**

10 A. There is hereby established a Koror State Park to be known as “Long Island Park and  
11 Conservation Area”.

12 B. The Long Island Park and Conservation Area (the “Park”) shall consist of all of the  
13 marine and terrestrial areas shown in the map appended to this Act, which map is hereby  
14 incorporated into and made a part of this Act. The Park shall consist of all fringing reef and island  
15 areas of Ngermalk Island, including all land and fringing reef areas to the east of Ernguul Road  
16 except the fill area of Toi Rois, more particularly described as being within the following boundary:  
17 beginning at a point where the Kosiil Bridge meets Ngermalk Island fringing reef at the western end  
18 of the Kosiil Bridge, then continuing in a southeasterly direction along the reef to Ongelungel, and  
19 through Ongelungel along the eastern edge of Ngermalk Island to the southernmost tip of Ngermalk  
20 Island, then following the shoreline and outer edge of the fringing reefs in a northwesterly direction  
21 to the eastern edge of Ernguul Road, and then along the causeway back to the southeastern edge of  
22 the fringing reef at the Kosiil Bridge (the starting point). But excepting therefrom the following  
23 leased area known as Toi Rois, which abuts Ernguul Road and the road to Long Island, which leased  
24 area includes all fill area leased by the Koror State Public Lands Authority to the current lessee.

25 **Section 4. Development of park areas; restrictions and prohibitions.**

26 A. Koror State Government, alone or in consultation or conjunction with any other persons  
27 or entities, shall provide for the development and maintenance of Park facilities and recreational  
28 areas, and other public service areas and utilities.





1           B. It shall be unlawful to fish for, take, harvest, remove, transport, touch, or otherwise  
2 control any marine flora or any marine fauna, or any parts thereof, within the marine areas of the  
3 Long Island Park and Conservation Area. It shall be unlawful to remove any marine flora or fauna,  
4 or parts thereof, from the waters and reefs of the Long Island Park and Conservation Area. It shall  
5 be unlawful to possess any marine flora or fauna, or parts thereof, in the waters of the Long Island  
6 Park and Conservation Area.

7           C. It shall be unlawful to take, harvest, remove, possess, transport, touch, cut, destroy, or  
8 otherwise control any terrestrial flora or any terrestrial fauna within the Long Island Park and  
9 Conservation Area, including seeds and parts of plants, and animal parts or eggs. It shall be unlawful  
10 to remove any terrestrial flora or terrestrial fauna from the Long Island Park and Conservation Area,  
11 including seeds and parts of plants, and animal parts or eggs. It shall be unlawful to introduce any  
12 terrestrial flora or fauna into the Long Island Park and Conservation Area.

13           D. The prohibitions of this Section shall not apply to activities performed by Koror State  
14 Government or its employees, contractors, or agents, or any person who receives advance written  
15 permission from the Governor for non-commercial activities, and who is acting within the scope of  
16 such written permission, and not for economic gain or profit.

17           **Section 5. Regulations.** The Governor is authorized to promulgate regulations relating to  
18 the use and activities conducted at the Long Island Park and Conservation Area. Such regulations  
19 shall have the force and effect of law, and a violation of the regulations may be punished as a  
20 violation of this Act.

21           **Section 6. Penalties.**

22           A. Any person who violates any provision of this Act shall, upon conviction, be fined at least  
23 one-hundred dollars (\$100.00), and no more than five-hundred dollars (\$500.00). Each subsequent  
24 conviction after the first offense shall be punished by a fine of five hundred dollars (\$500.00).

25           B. It shall be unlawful to violate any regulations issued by the Governor pursuant to this Act.  
26 Any person who violates any provision of this subsection shall, upon conviction, be fined at least  
27 one-hundred dollars (\$100.00), and no more than five-hundred dollars (\$500.00). Each subsequent  
28 conviction for violation of regulations after the first offense shall be punished by a fine of five

1 hundred dollars (\$500.00).

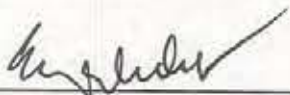
2 C. It shall be unlawful to aid, abet, counsel, command, induce, or procure or cause the  
3 commission of a violation of Section 4 of this Act or the regulations promulgated under this Act,  
4 which if directly performed by any person would be a violation of Section 4 of this Act or such  
5 regulations, and any such person shall be punished as a principal and upon conviction, shall be fined  
6 at least one-hundred dollars (\$100.00), and no more than five-hundred dollars (\$500.00), with  
7 increased fines for each subsequent or multiple violations. No distinction is made between  
8 principals in degrees, and no distinction is made between a principal and what may be referred to as  
9 an accessory before the fact.

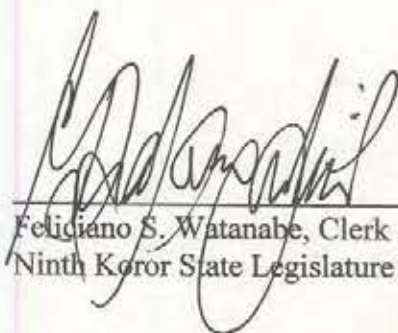
10 **Section 7. Severability.** In the event that a court of competent jurisdiction determines that  
11 any part or portion of this Act are invalid or otherwise unenforceable, then the offending part or  
12 portions may be stricken, and the remaining portions shall continue in full force and effect.

13 **Section 8. Effective Date.** This Act shall become effective upon its becoming law by  
14 operation of the Koror State Constitution.

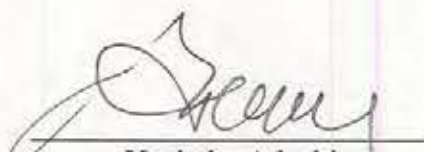
**PASSED: NOVEMBER 10, 2011**

**AS CERTIFIED AND ATTESTED TO BY :**

  
Legislator Eyo Rudimch, Speaker  
Ninth Koror State Legislature

  
Feliciano S. Watanabe, Clerk  
Ninth Koror State Legislature

APPROVED ON THIS <sup>of \*\*\*\*\*</sup> 21 DAY OF November, 2011.

  
Yositaka Adachi  
Governor, State of Koror



1-21-11-59-101



Image © 2011 DigitalGlobe

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Imagery Date: 4/21/2009

7°20'11.20" N 134°27'44.12" E elev. 65 m

Eye alt 1.15 km

## Koror State Government Revenue Sources for Fiscal Year 2009-2011

| Source                                                 | 2009<br>Amount         | 2010                   | 2011                   |
|--------------------------------------------------------|------------------------|------------------------|------------------------|
| KSPL No. K6-99-99 Boat Registration Act                | \$ 3,000.00            | \$ 9,500.00            | \$ 9,500.00            |
| KSPL No. K5-76-97 Building Permit Fee                  | \$ 3,000.00            | \$ 10,000.00           | \$ 13,000.00           |
| MO No. 46-69 Business License Fee                      | \$ 16,000.00           | \$ 60,000.00           | \$ 60,000.00           |
| KSPL No. K6-107-2000 Cruising Permit Fee               | \$ 1,000.00            | \$ 1,000.00            | \$ 1,000.00            |
| KSPL No. K6-113-2000 Diving & Rock Island Use Fee      | \$ 550,000.00          | \$ 2,770,775.00        | \$ 3,100,000.00        |
| KSPL No. K7-138-2003 Fishing License Fee               | \$ 30,000.00           | \$ 90,000.00           | \$ 120,000.00          |
| KSPL No. K5-72-96 House Party                          | \$ 2,000.00            | \$ 7,000.00            | \$ 7,000.00            |
| MO No. 50-69 Photo Fee                                 | \$ 5,000.00            | \$ 50,000.00           | \$ 50,000.00           |
| KSPL No. K5-79-97 Property Tax                         | \$ 24,000.00           | \$ 100,000.00          | \$ 100,000.00          |
| KSPL No. K5-72-96 Traditional Tax                      | \$ 500.00              | \$ 1,000.00            | \$ 1,000.00            |
| KSPL No. K5-79-97 Vehicle Registration Fee             | \$ 15,000.00           | \$ 45,000.00           | \$ 50,000.00           |
| Aggregate Royalty                                      | \$ 10,000.00           | \$ 50,000.00           | \$ 59,200.00           |
| Commercial Lease                                       | \$ 450,000.00          | \$ 1,450,000.00        | \$ 1,500,000.00        |
| Curfew Fines/Settlement                                | \$ 10,000.00           | \$ 30,000.00           | \$ 20,000.00           |
| Equipment Rental                                       | \$ 1,000.00            | \$ 3,000.00            | \$ 2,000.00            |
| Housing Rental                                         |                        |                        |                        |
| Residential Lease                                      | \$ 35,000.00           | \$ 123,000.00          | \$ 130,000.00          |
| Entry Fee/Dockage /Wharfage                            | \$ 5,000.00            | \$ 90,000.00           | \$ 90,000.00           |
| Senate Resolution No. 5 Fishing Rights Fee             | \$ 55,000.00           | \$ 260,000.00          | \$ 260,000.00          |
| 11 PNC 1041 Retail Licenses of Alcohol & Tobacco Sales | \$ 11,000.00           | \$ 35,000.00           | \$ 35,000.00           |
| KSPL No. K6-124-2001 Live Aboard Impact Fee            | \$ 5,000.00            | \$ 20,000.00           | \$ 20,000.00           |
| Reserved Account                                       |                        |                        |                        |
| Coral Sales                                            |                        | \$ 120,000.00          | \$ 150,000.00          |
| Others 1                                               | \$ 67,000.00           | \$ 50,000.00           | \$ 92,625.00           |
| Water/Land Use Right                                   | \$ 15,000.00           | \$ 264,000.00          | \$ 100,000.00          |
|                                                        |                        |                        |                        |
| <b>Total Local Revenues</b>                            | <b>\$ 1,313,500.00</b> | <b>\$ 5,639,275.00</b> | <b>\$ 5,970,325.00</b> |
|                                                        |                        |                        |                        |
| RPPL 5-34 and 5-41 Legislative Appropriation Balance   |                        | \$ 31,416.00           |                        |
| a. Ngerkesouaol Dock Dredging \$31,415.60              |                        | \$ 17,588.00           |                        |
| b. Iyebukel Landfill & Headstart - \$17,588.00         |                        | \$ 7,639.00            |                        |
| c. Ngerkebsang Road Pavement - \$7,639.00              |                        | \$ 294,539.00          |                        |
| National Appropriation FY 2008 & FY 2009 RPPL 7-37     |                        | \$ 824,250.00          |                        |
| RPPL 5-41 Ngara Amayong Abai                           |                        |                        |                        |
| <b>Total National Appropriation*</b>                   |                        | <b>\$ 1,175,432.00</b> | <b>\$ 780,000.00</b>   |
|                                                        |                        |                        |                        |
| <b>Grand Total</b>                                     | <b>\$ 1,313,500.00</b> | <b>\$ 6,814,707.00</b> | <b>\$ 6,750,325.00</b> |
|                                                        |                        |                        |                        |

\*National Appropriation has yet to be received

AN ACT

To authorize and appropriate three percent (3%) of the fees collected for rock island use permits and for Jellyfish Lake use permits to be deposited into a segregated account until further appropriation by law for emergencies and other contingencies, and for related purposes.

THE PEOPLE OF KOROR REPRESENTED IN THE LEGISLATURE OF THE STATE OF KOROR DO ENACT AS FOLLOWS:

1           **Section 1. Findings.**

2           The Ninth Koror State Legislature hereby finds that as of this time, Koror State Government  
3 does not have any "reserve fund" of any kind in the State treasury, to be used for unforeseen  
4 contingencies, natural disasters, or for other emergency purposes. Koror State receives significant  
5 annual revenues from rock island use permits, and the designation of three percent (3%) of such  
6 amount could satisfactorily provide an annual amount to be deposited into a reserve fund, to remain  
7 in the treasury until authorized and appropriated by law.

8           **Section 2. Creation of reserve fund in State treasury; source of funds; commencement**  
9 **date for deposits into reserve account.**

10           A. There is hereby created and established within the Koror State treasury a reserve fund,  
11 to be a segregated account within the Koror State treasury, and to be used only for unforeseen  
12 contingencies, natural disasters, or for other emergency purposes, as determined by law. No such  
13 reserve funds may be obligated, encumbered, or spent unless authorized and appropriated by law.

14           B. The source of the deposits for the reserve fund shall be fees collected for rock island use  
15 permits under KSPL No. K8-207-2009. A total of three percent (3%) of the fees collected each year  
16 for rock island use permits, collected from January 1<sup>st</sup> of each year through and including December  
17 31<sup>st</sup> of each year, shall be deposited into such segregated reserve account within the Koror State  
18 treasury. The rock island permit fees collected on and after January 1, 2011 shall be subject to the  
19 deposit requirements of this Act.

20           C. The funds required to be deposited by this Act shall be deposited on a quarterly basis,  
21 within fifteen (15) days of the close of each quarter. The deposits shall be made on or before April

1 15<sup>th</sup> for the revenues received during the first quarter of the fiscal year, by July 15<sup>th</sup> for the revenues  
2 received during the second quarter of each year, by October 15<sup>th</sup> for the revenues received during the  
3 third quarter of each year, and by January 15<sup>th</sup> of the following year for the revenues received during  
4 the fourth quarter of each year. The first quarterly deposit shall be made on or before April 15, 2011.

5 **Section 3. Severability.**

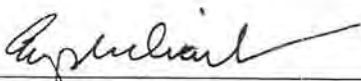
6 In the event that a court of competent jurisdiction determines that any part or portion of this  
7 Act are invalid or otherwise unenforceable, then the offending part or portions may be stricken, and  
8 the remaining portions shall continue in full force and effect.

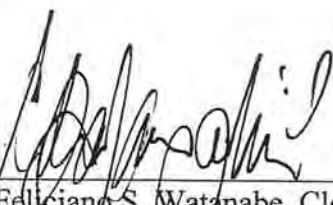
9 **Section 4. Effective Date.**

10 This Act shall become effective on January 1, 2011.

PASSED: July 13, 2010


AS CERTIFIED AND ATTESTED TO BY:

  
Legislator Eyos Rudimch, Speaker  
Ninth Koror State Legislature

  
Feliciano S. Watanabe, Clerk  
Ninth Koror State Legislature

\*\*\*\*\*

APPROVED ON THIS 20<sup>th</sup> DAY OF July, 2010.

  
Yositaka Adachi  
Governor, Koror State

AN ACT

To extend the time for the promulgation of the Rock Islands Southern Lagoon Management Plan, and to extend the time for the effective dates of the Rock Islands Southern Lagoon Management Plan, and for related purposes.

**THE PEOPLE OF KOROR REPRESENTED IN THE LEGISLATURE OF THE STATE OF KOROR DO ENACT AS FOLLOWS:**

1           **Section 1. Findings.** The Ninth Koror State Legislature hereby finds that the Rock Islands  
2 Southern Lagoon Management Plan contains a time line that contemplates the adoption of  
3 regulations, and that KSPL No. K7-161-05 authorizes the Governor to promulgate regulations, which  
4 will thereafter repeal the Rock Islands Management and Protection act, and all amendments thereto.  
5 Koror State Government has enacted several marine protection laws over the years, which need to  
6 be included in the regulations. In order to qualify for "World Heritage" status, the evaluation and  
7 review of the regulations and laws should be completed by the end of calendar year 2011.

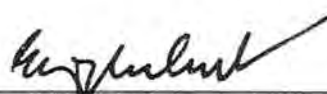
8           **Section 2. Extension of time for promulgation of regulations to implement the Rock**  
9 **Islands Southern Lagoon Management Plan.** Koror State Government, in accordance with KSPL  
10 No. K7-161-05, shall promulgate rules and regulations for the implementation and enforcement of  
11 the Rock Islands Southern Lagoon Management Plan by December 31, 2011.

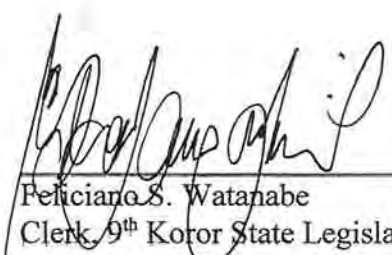
12           **Section 3. Severability.** In the event that a court of competent jurisdiction determines that  
13 any part or portion of this Act is invalid or otherwise unenforceable, then the offending part or  
14 portion may be stricken, and the remaining portions shall continue in full force and effect.

15           **Section 4. Effective Date.** This Act shall become effective upon its becoming law by  
16 operation of the Koror State Constitution.

**PASSED:**     May 13, 2010

**AS CERTIFIED AND ATTESTED TO BY:**

  
\_\_\_\_\_  
Legislator Eynos Rudimch  
Speaker, 9<sup>th</sup> Koror State Legislature

  
\_\_\_\_\_  
Feliciano S. Watanabe  
Clerk, 9<sup>th</sup> Koror State Legislature

Approved on this 25<sup>th</sup> day of May, 2010.

\*\*\*\*  
  
\_\_\_\_\_  
Yositaka Adachi  
Governor, Koror State





**Palau National Commission for UNESCO**

**P.O. Box 1526  
Koror, Palau 96940**

**Tel: (680) 488-2489/3361; Fax: (680) 488-2657/3594**

**Email: [histspres@palaunet.com](mailto:histspres@palaunet.com) or [delbochel@gmail.com](mailto:delbochel@gmail.com)**

NCU: 12-001  
28 February 2012

Ms. Christelle Perruchoud  
Christelle Perruchoud  
Programme Assistant  
World Heritage Programme  
IUCN (International Union for Conservation of Nature)  
28 rue Mauverney, CH-1196 Gland, Switzerland

Dear Ms. Perruchoud,

Greetings and I hope this letter finds you well. Attached please find Palau's response to the latest query sent by IUCN on 03 February 2012. There were two points and I am sure you will find the appropriate response with relevant maps to reflect the changes made to ensure we have addressed your concerns with certain areas in the designated Rock Island Southern Lagoon area.

Copied here is Mr. Alessandro Balsamo of UNESCO World Heritage Center. Should you need additional information, we are most willing to provide as soon as we can. Thank you kindly for your continued support and assistance in this endeavor.

Most sincerely,

Dwight G. Alexander  
Secretary General  
Palau National Commission for UNESCO

Attachments

xc: Mr. Alessandro Balsamo, World Heritage Center  
Hon. Faustina Rehuher Marugg, Minister of Community & Cultural Affairs  
Dwight G. Alexander, SG., Palau Natcom



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**Email: [histspres@palaunet.com](mailto:histspres@palaunet.com) or [delbochel@gmail.com](mailto:delbochel@gmail.com)**

NCU: 12-002  
28 February 2012

Mrs Gwenaëlle Bourdin  
WH Programme Senior Specialist  
World Heritage Unit / Unité patrimoine mondial  
ICOMOS International Council on Monuments and Sites  
Conseil International des Monuments et des Sites  
49 - 51 rue de la Fédération  
75015 Paris France

Dear Mrs. Gwenaëlle Bourdin,

Greetings and I hope this letter finds you well. Please find attached our response to the query sent to us on 14 December 2011 seeking additional information and clarification on a number of matters. I trust that you will find the information relevant and adequately addresses the concerns raised by the Advisory Body. I have also attached maps in a separate email to reflect the changes made in the designated area and inclusion of Ngerchong Island.

I hope the information is satisfactory and if not, please kindly inform us and we will be happy to provide additional information. Thank you for your kind assistance and support in this matter.

Most sincerely,

Dwight G. Alexander  
Secretary General  
Palau National Commission for UNESCO

Attachments

xc: Jung Young Hun, World Heritage Center  
Hon. Faustina Rehuher Marugg, Minister of Community & Cultural Affairs  
Dwight G. Alexander, SG., Palau Natcom

**World Heritage List 2012**  
**Republic of Palau,**  
**Rock Islands Southern Lagoon (RISL) Nomination**  
**Supplementary Information to**  
**IUCN and the World Heritage Programme**  
February 28, 2012

1) Point 1:

“b) A map and bathymetric information including supporting documents detailing such changes for the boundaries would be provided in February 2012.”

“c) The map to be sent in February 2012 will list sites within the property more clearly.”

Please see the maps of the nominated property with sites properly identified. Also attached is the latest and only bathymetric information available to date.

Maps and bathymetry data

1. RISLWH\_1\_lettersize.jpg – Map of the nominated property
2. RISLWH\_2L\_coordinates.jpg – Map of the nominated property with coordinates
3. RISLWH3L\_SPMZ.jpg – Map of the Special Management Zones of concern
4. Bathymetry data - PalaulagoonNEC\_kororst.xlsx
5. FEB2012\_signatures UNESCOMapApproval.pdf - Official approval from local authority on the revised nomination map – Koror State Government.

It was envisioned in November 2011, that the bathymetric information could be overlaid in a consolidated map of the nomination. However, the lead management authority and State Party cannot provide such a map at this time, because of the following reasons:

- Current bathymetric information is based on work that is still ongoing by Palau International Coral Reef Center (PICRC).
- It will take at least a year or more to conduct the ground-truth and data conversion work to make such data transferrable to a visual layer on a map.
- Funding is needed to support such efforts above, in which outside resources would need to be sought as this work is a need for the whole nation/Palau archipelago.

- The local management authority does not have the capacity to produce a map with bathymetric information.

The local management authority is reviewing its management plan and can only begin efforts to solidify its partnerships with PICRC and Palau Automated Land and Information Systems (PALARIS) so that they will have the institutional and funding capacity to produce such a map.

## 2) Point 3:

“The area of concern (northern boundary/excluded urban area) would be established as a buffer zone and would be indicated in the map to be submitted February 2012.”

It was envisioned in November 2011, by the lead management authority that the area of concern, northern boundary/excluded urban area, would be established as a buffer zone but after much deliberation this would not be practical for management and it would not be following the world heritage operating guidelines to define as such.

The area of concern to the south of the Excluded Urban Area has been defined as Special Management Zone –Ngederrak, which is set up according to dugong's regular routes. The area is approximately ninety six square kilometers (96km<sup>2</sup>) and cover sea grass bed, small patches of coral reef and sandy bottom that provide dugongs resting and feeding. This area includes a protected area, shipping lane, outfall from the sewage treatment plant, some aquaculture giant clam farms, the dolphin pacific facility, and as well as the sand mining area. All of which are indicated on the map as special management zones. The lead authority will make a coordinated effort to ensure that these activities will be monitored and managed in coordination with relevant regulatory agencies. Strict controls and no expansion limits will be proposed objectives for these activities as part of the management review process.

Please see attached the latest outputs as part of the review of the management plan for the nominated property, which is still ongoing.

## 6. RISL goals, objectives & activities post 2nd meeting clean version.docx

Note that this document has yet to be finalized. It is envisioned that this document will be the framework of new management plan for the RISL, which will be completed and given authority by June 2012. Findings from the advisory bodies and concerns are addressed in the objectives and activities outlined in the attached document, which is the best that can be provided thus far for points 7 and 8.

A buffer zone for the nominated property as depicted on the map, is up to 12 nautical miles, are only within the limits of Koror State jurisdiction. The lead applicant, Koror State Government must still address issues where state boundaries abutts the boundaries with neighboring states, Airai and Aimeliik State in the North and Peleliu State in the South.

**World Heritage List 2012**  
**Republic of Palau,**  
**Rock Islands Southern Lagoon (RISL) Nomination**  
**Additional Information to**  
**ICOMOS and the World Heritage Programme**

February 28, 2012

- 1) [Provide a timetable for the inclusion of the remaining unregistered village and rock art sites named in the nomination dossier](#)

Timetable cannot be provided at this time. State party needs more time and lead management authority needs to build their capacity to properly manage all village and rock art sites within the nominated property. The lead management authority is currently in the review process of the RISL management plan. Further time is needed for relevant departments to agree on a set of actions and timetable. Please see attached the latest outputs as part of this review process for the nominated property, which is still ongoing.

1. [RISL goals, objectives & activities post 2nd meeting clean version.docx](#)

See pages 7-9, of the document stated above, See Goal 3 – Cultural and Historical Preservation, with objectives and specific actions.

Note that this document has yet to be finalized. It is envisioned that this document will be the framework of the new management plan for the RISL, which will be completed and given authority by June 2012.

- 2) [Extend the property boundary to the south-east to include Ngerechong Island as also recommended by IUCN.](#)

Please see the maps of the nominated property that has extended the nominated property to include Ngerechong and the other recommendations by IUCN.

Maps

2. [RISLWH\\_1\\_lettersize.jpg](#) – Map of the nominated property
3. [RISLWH\\_2L\\_coordinates.jpg](#) – Map of the nominated property with coordinates
4. [RISLWH3L\\_SPMZ.jpg](#) – Map of the Special Management Zones of concern
5. [FEB2012\\_signatures UNESCOMapApproval.pdf](#) - Official approval from local authority on the revised nomination map – Koror State Government.

- 3) Consider the revision of the name of the nominated property to reflect its cultural as well as natural values.

This will be considered by the State Party and will require time to consult with traditional leaders, traditional groups, and the state government before it can be provided. Please see the document referred in point one that states this as an activity to be done by 2015.

1. RISL goals, objectives & activities post 2nd meeting clean version.docx

See pages 7-9, of the document stated above, See Goal 3 – Cultural and Historical Preservation, with objectives and specific actions.

Note that this document has yet to be finalized.

- 4) Provide a timetable for the completion of the Management Plan to cover all the cultural sites and implementation of the Management Plan.

Please see comments under point one. To provide a timetable to cover all the cultural sites in the RISL would be unrealistic at this time, please see the timeframe outline in the document referred in point one.

134°20'0"E

134°25'0"E

134°30'0"E

134°35'0"E

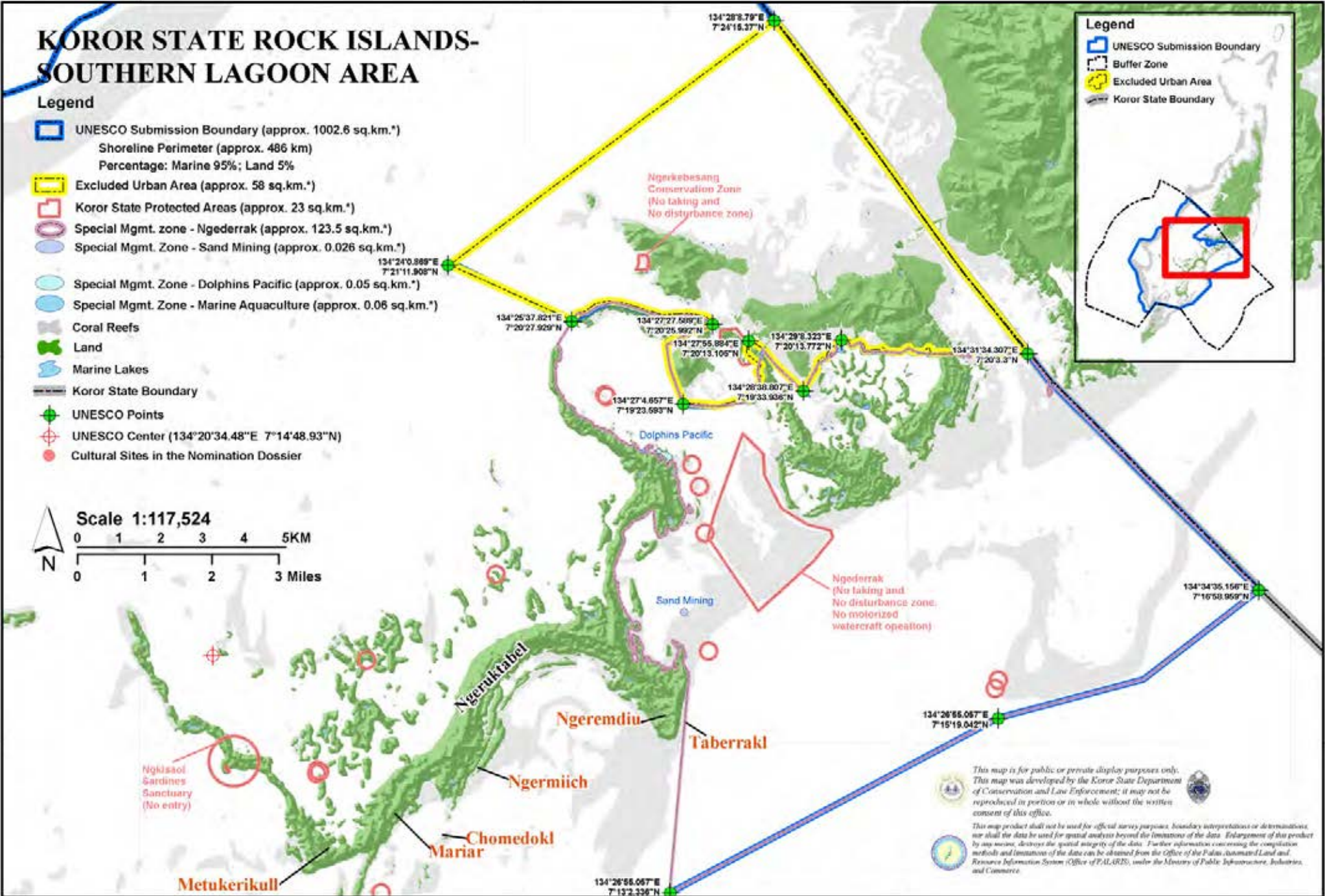
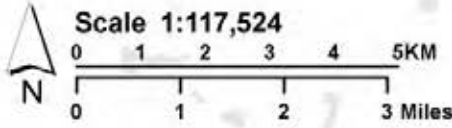
# KOROR STATE ROCK ISLANDS- SOUTHERN LAGOON AREA

## Legend

- UNESCO Submission Boundary (approx. 1002.6 sq.km.)\*  
Shoreline Perimeter (approx. 486 km)  
Percentage: Marine 95%; Land 5%
- Excluded Urban Area (approx. 58 sq.km.)\*
- Koror State Protected Areas (approx. 23 sq.km.)\*
- Special Mgmt. zone - Ngederrak (approx. 123.5 sq.km.)\*
- Special Mgmt. Zone - Sand Mining (approx. 0.026 sq.km.)\*
- Special Mgmt. Zone - Dolphins Pacific (approx. 0.05 sq.km.)\*
- Special Mgmt. Zone - Marine Aquaculture (approx. 0.06 sq.km.)\*
- Coral Reefs
- Land
- Marine Lakes
- Koror State Boundary
- UNESCO Points
- UNESCO Center (134°20'34.48"E 7°14'48.93"N)
- Cultural Sites in the Nomination Dossier

### Legend

- UNESCO Submission Boundary
- Buffer Zone
- Excluded Urban Area
- Koror State Boundary



*This map is for public or private display purposes only. This map was developed by the Koror State Department of Conservation and Law Enforcement; it may not be reproduced in part or in whole without the written consent of this office.*

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134°20'0"E

134°25'0"E

134°30'0"E

134°35'0"E

7°20'0"N

7°20'0"N

7°15'0"N

7°15'0"N





# KOROR STATE ROCK ISLANDS- SOUTHERN LAGOON AREA

## Legend

- UNESCO Points
- ⊕ UNESCO Center (134°20'34.48"E 7°14'48.93"N)
- UNESCO Submission Boundary (approx. 1002.6 sq.km.)  
Shoreline Perimeter (approx. 486 km)  
Percentage: Marine 95%; Land 5%
- Excluded Urban Area (approx. 58 sq.km.)
- Koror State Protected Areas (approx. 23 sq.km.)
- UNESCO Submission Area Buffer zone (12 nautical mile, approx. 1640 sq.km.)
- Special Mgmt. zone - Ngederrak (approx. 123.5 sq.km.)
- Special Mgmt. Zone - Sand Mining (approx. 0.026 sq.km.)
- Special Mgmt. Zone - Dolphins Pacific (approx. 0.05 sq.km.)
- Special Mgmt. Zone - Marine Aquaculture (approx. 0.06 sq.km.)
- Marine Lakes
- Koror State Boundary
- Cultural Sites in the Nomination Dossier

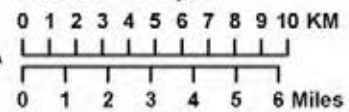
## Legend

- UNESCO Submission Boundary
- Buffer Zone
- Excluded Urban Area
- Koror State Boundary

120°0'0"E 140°0'0"E 160°0'0"E

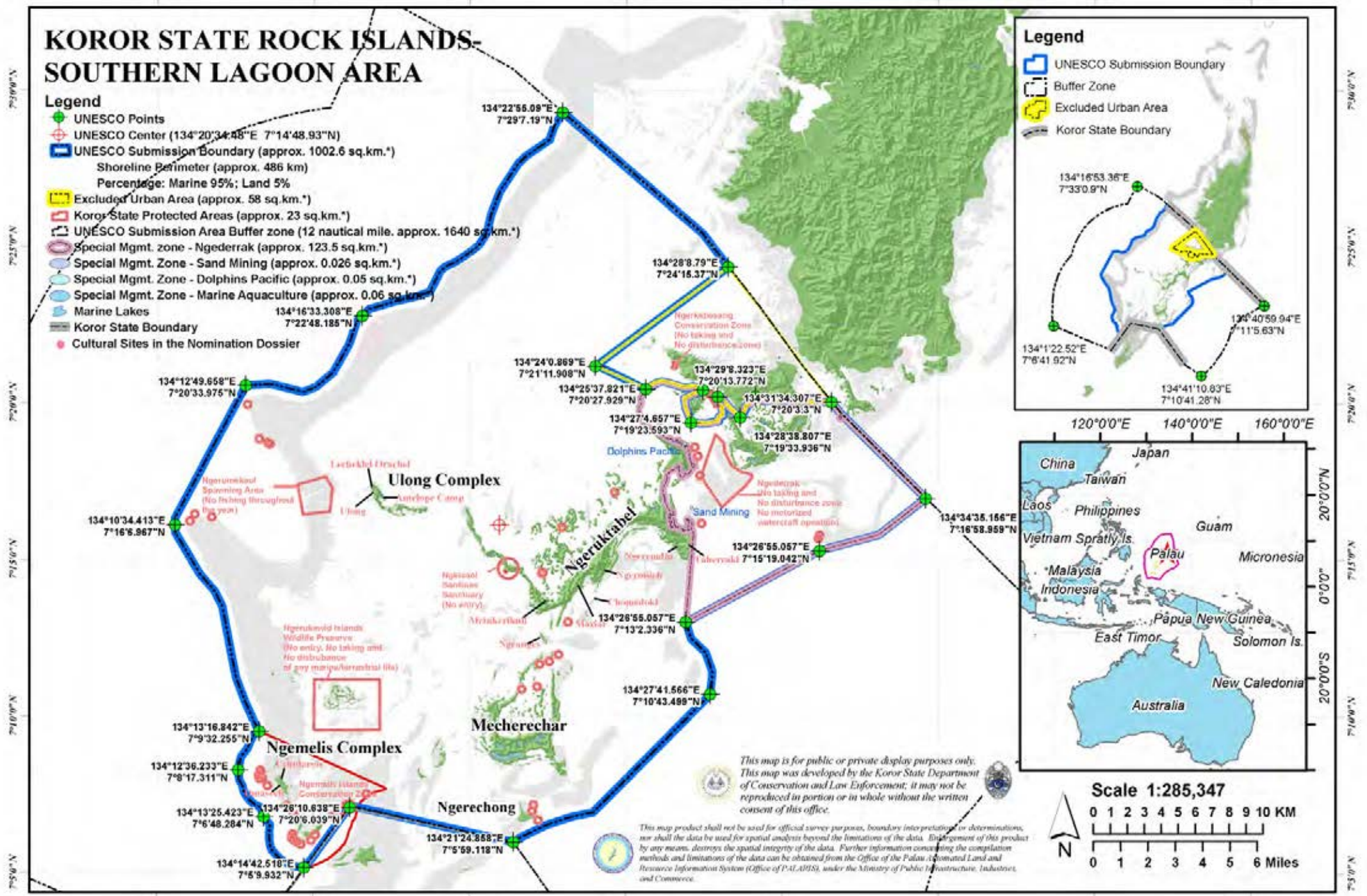


Scale 1:285,347



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# Koror State Government

P.O. Box 116  
KOROR, REPUBLIC OF PALAU 96940

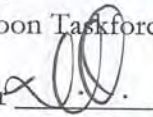


**Department of Conservation  
and  
Law Enforcement**

Tel: 680 488 4001/8738 Main Office  
680 488 2150 Field Office  
Fax: 680 488 2862  
Email: [rica@kororstate.org](mailto:rica@kororstate.org) | [rorangers@palaunet.com](mailto:rorangers@palaunet.com)

## Memo

To: Honorable Yositaka Adachi, Governor  
Koror Planning Commission  
Koror State Public Land Authority  
9th Koror State Legislature  
Rock Island Southern Lagoon Taskforce Executive Committee

From: Ilebrang Olkeriil, Director 

Date: February 27, 2012

**Subject: Approve Map for UNESCO Submission**

---

Dear Sirs and Madams,

Please see attached the revised map for our nomination of the Rock Islands Southern Lagoon to the World Heritage List. The changes to the map have been made as suggested by the two advisory bodies to the World Heritage Committee, International Union for Conservation of Nature (IUCN), and International Council on Monuments and Sites (ICOMOS), which are the following:

- Include the northern boundary as part of the nomination and the island of Ngerechong
- Address the concerned area, which includes Ngederrak, ship lane, and Dolphins Pacific, which has been made more clearly as a Special Management Zone within the nominated property.
- Identified the jurisdiction of Koror State waters up to 12 nautical miles, which was made a buffer zone starting from barrier reef up to 12 nautical miles.

The changes have only made clear visually on a map the management and authority that already exists and manages the Rock Islands. These changes were made to meet requirements within the guidelines of the World Heritage nomination process and the suggestions from IUCN and ICOMOS.

I request your official endorsement of this map, so it can be sent by 10am tomorrow morning, February 28, 2012, the deadline requested from the advisory bodies.

Your attention to this matter would be greatly appreciated.

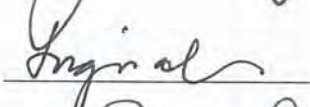
## Approve map for UNESCO Nomination

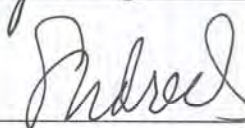
1. Yositaka Adachi, Governor  (signature) 2/21/12 (date)


### Koror Planning Commission

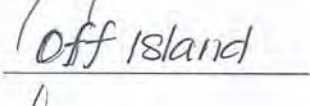
2. Magdalena Antonio, Director BZO  (signature) 02/27/2012 (date)

3. John Wong, Chairman  (signature) 2/27/12 (date)

4. Tutoud Ngiralmu, Vice Chairman  (signature) 2-27-12 (date)

5. Sebastian Baste Andreas, Member  (signature) 2-28-12 (date)

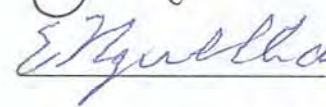
6. Johnny Yaoch, Member  (signature) 2-28-12 (date)

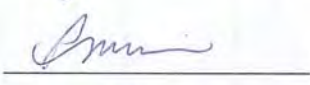
7. Charles Uong, Member  (signature) 2/28/12 (date)

8. George Kebekol, Member  (signature) 2/28/12 (date)

### Koror State Public Land Authority

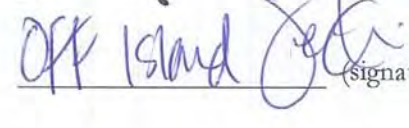
9. Dilsils Kanai, Director KSPLA  (signature) 02/27/2012 (date)

10. Ermas Ngiraelbad, Chairman  (signature) 02/27/2012 (date)

11. Rosemary Mersai, Vice Chairman  (signature) 02/28/12 (date)

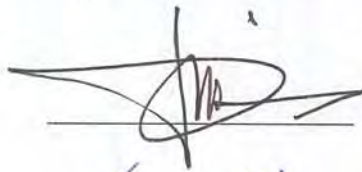
12. Faustina Meyar, Member  (signature) 02/28/12 (date)

13. Eugene Uehara, Member  (signature) 02/28/12 (date)

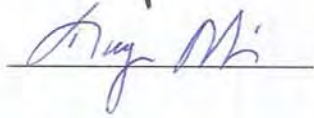
14. Laurinda Mariur, Member  (signature) 02/28/2012 (date)

## Approve map for UNESCO Nomination

15. Fritz Koshiha, Member

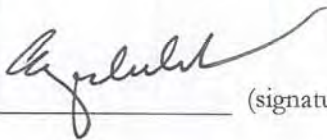
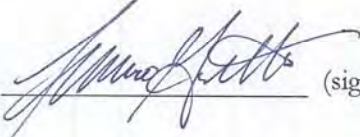
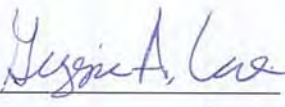
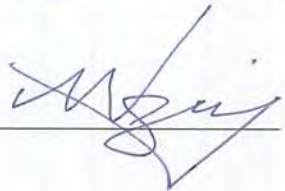
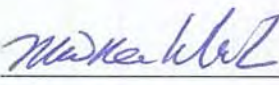
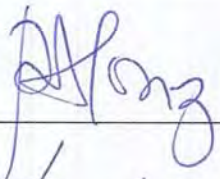
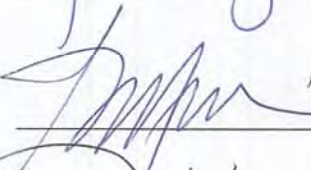
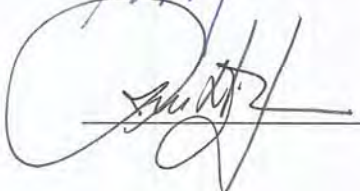
 (signature) 2-28-12 (date)

16. Kuye Belesai, Member

 (signature) 2-28-12 (date)

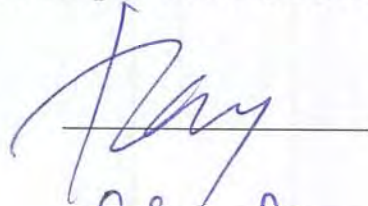
## Approve map for UNESCO Nomination

### 9th Koror State Legislature

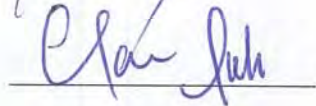
1. Eyos Rudimch, Speaker  
Iyebukel Hamlet  (signature) 2/27/12 (date)
2. Franco Gibbons, Vice Speaker  
At-Large  (signature) 2/27/12 (date)
3. Ehrlick Termeteet, Floor Leader  
Ngerchemai Hamlei - off-island - (signature) \_\_\_\_\_ (date)
4. Wilson Ngirausui  
Ngermid Hamlet - off-island - (signature) \_\_\_\_\_ (date)
5. Geggie Udui  
Ngerkesoal Hamlet  (signature) 2/27/12 (date)
6. Augusto Ngirmang  
Meketii Hamlet  (signature) 02-27-12 (date)
7. Merol Ngirmeriil  
Idid Hamlet - off-island - (signature) \_\_\_\_\_ (date)
8. Mengkur Rechelulk  
Dngeronger Hamlet  (signature) 2/27/12 (date)
9. Richard Alonz  
Ikelau Hamlet  (signature) 2-27-12 (date)
10. Felix Francisco  
Ngerbeched Hamlet  (signature) 2/27/12 (date)
11. Jason Nolan  
Medalaii Hamlet  (signature) 2/27/12 (date)

## Approve map for UNESCO Nomination

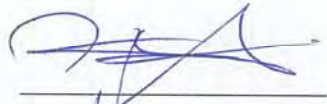
12. Leorry Ngiramowai  
Meyuns Hamlet

 (signature) 2/27/12 (date)

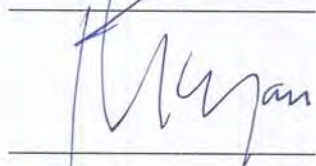
13. Clarence M. Saka  
Ngerkebsang Hamlet

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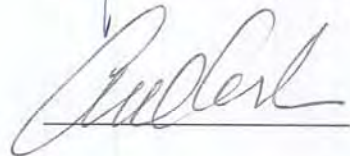
14. Kazuki Topps Sungino  
At Large

 (signature) 2/27/12 (date)


15. Millan Isack  
At-Large

 (signature) 2/28/12 (date)

16. Ann L. Pedro  
At-Large

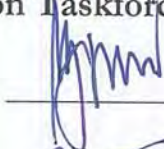
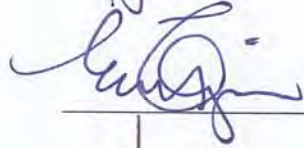
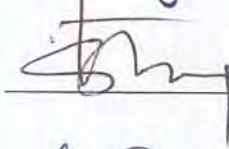
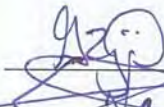
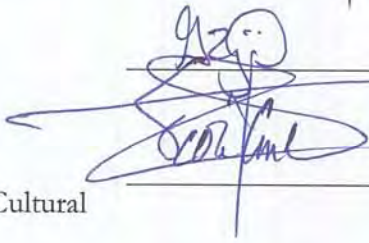
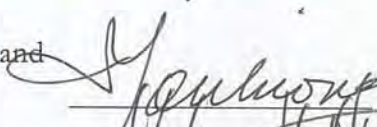
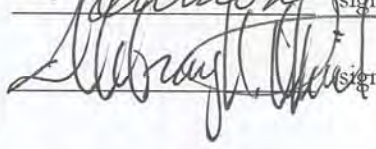
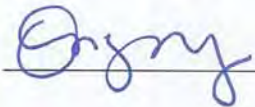
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17. Uchel Sechewas  
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 (signature) 2/27/12 (date)

## Approve map for UNESCO Nomination

### Rock Island Southern Lagoon Taskforce Executive Committee

1. Elia Yobech, Iyechaderchemai  
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2. Ernest Ongidobel,  
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8. Sunny Ngirmang  
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### RISL Taskforce Executive Committee Members already Listed:

9. Honorable Yositaka Adachi,  
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10. Eyos Rudimch, Speaker  
Iyebukel Hamlet,  
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## Approve map for UNESCO Nomination

11. Franco Gibbons, Vice Speaker  
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12. Jason Nolan  
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13. Ermas Ngiraelbad, Chairman  
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14. Tutoud Ngiralmu, Vice Chairman  
RISL Taskforce Executive  
Committee/Koror State Planning  
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15. Laurinda Mariur  
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Koror State Traditional Women's  
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# **Goals, strategies, objectives and activities of the Koror State Rock Island Southern Lagoon**

## **Management Vision**

To maintain the spectacular beauty and the abundant and diverse natural and cultural resources of the Rock Islands Southern Lagoon Area, so that it can continue to be used and enjoyed by current and future generations of the people of Koror and Palau and remain a central part of our culture and lifestyle, and for the current and future enjoyment of the world.

## **Overarching Management Goal**

To provide for the sustainable use and conservation of the natural and cultural resources of the Rock Island Southern Lagoon.

## **Key Management Goals**

### **Goal 1: Biodiversity/ Natural System Health Enhancement**

Maintain the full range and richness of biological diversity, species habitats, ecological processes and high environmental quality of the RISL.

### **Goal 2: Subsistence and Commercial Fisheries Improvement**

Subsistence and commercial fishing and other extractive activities in the RISL are environmentally and economically sustainable and culturally compatible, and provide continued benefits to the people of Koror and Palau.

### **Goal 3: Cultural and Historical Preservation**

Nurture and sustain Palauan culture by preserving and maintain the landscapes, artifacts and oral traditions associated with the stonework village sites in the RISL, and preserve Palau's historical sites.

### **Goal 4: Tourism, Recreation and Economic Enhancement**

High quality tourism and recreational activities in the RISL are environmentally and economically sustainable, culturally compatible and provide benefits to the people of Koror and Palau.

### **Goal 5: Koror State Government Institutional Capacity Building**

Improve the institutional capacity of Koror State Government to effectively manage the RISL, focusing on strengthening regulatory frameworks, enforcement and surveillance, and building relationships and communication with key organizations and stakeholders relevant to the implementation of activities.

## **Key Management Objectives**

### **Goal 1: Biodiversity/ Natural System Health Enhancement**

- ❖ Maintain or increase the health of essential fish habitats and fish species.
  - ❖ By 2015 essential fish habitats (sea grass, coral reefs and mangroves) for valuable food fish in the RISL are mapped and surveyed.
  - ❖ By 2016 management in the RISL is informed by data, such as the findings and recommendations of the Essential Fish Habitat surveys and monitoring of existing MPAs.
- ❖ By 2016 biological baseline data within the RISL has been developed, focusing on key terrestrial and marine species.
- ❖ By 2016 preserves have been set aside in the RISL to maintain the health of key species.
- ❖ By 2016 strategies have been developed to enhance the resilience of ecosystems in the RISL to climate change.
- ❖ By 2016 strategies and plans have been developed and implemented to prevent the establishment of new marine or terrestrial invasive species, and reduce the distribution and area covered by existing invasive species in the RISL.

### **Goal 2: Subsistence and Commercial Fisheries Improvement**

- Ensure fisheries are sustainable by decreasing overall fishing pressure in the RISL.
  - ❖ By 2016 Koror State Government has developed the institutional capacity to manage and regulate fisheries.
  - ❖ By 2016 subsistence and commercial fishing and other extractive activities in the RISL are guided by zones and associated regulations.
- ❖ By 2016 sustainable harvest guidelines for key species are developed.
- ❖ By 2016 aquaculture within the RISL is in accordance with Koror State Government aquaculture zones and regulations.

### **Goal 3: Cultural and Historical Preservation**

- Strengthen and enhance Koror State's traditional and cultural connection to the RISL stone work villages, and preserve historic sites within the RISL.
- ❖ By 2014 protocols and plans for maintaining and rehabilitating stonework village sites and features are developed.
- ❖ By 2016 village sites that are in critical need of care or rehabilitation have been identified, mapped and a plan for their rehabilitation developed.
- ❖ By 2015 50% of the traditional cheldebechel of Koror have access to information on the importance of the RISL to Koror's cultural heritage, and value the RISL's cultural sites.
- ❖ By 2016 key historical sites in the RISL (i.e. WWII wrecks) have been identified, mapped and a plan for their preservation developed.
- ❖ By 2016, a section depicting RISL and Koror State cultural traditions and historic era is established at the Belau National Museum.

### **Goal 4: Tourism, Recreation and Economic Enhancement**

- Enhance tourism guidelines and regulations and ensure that tourism operators and tourist guides are in compliance with these.

- ❖ By 2014 all tour operators are familiar with and are implementing tours according to the tour guide certification program.
- ❖ By 2016 tour operation guidelines and plans to ensure sustainable and low impact tourism have been developed.
- Strengthen and enhance the cultural aspect of Koror State's RISL visitor experience.
  - ❖ By 2015 the cultural heritage of at least 5 tourism sites have been identified and developed as part of the RISL visitor experience.
  - ❖ By 2014 cultural heritage training for tour guides has been developed and incorporated into tourist guide training.
  - ❖ By 2016 at least 25% of tour operators in the RISL have integrated traditional cultural resource tours into their tour programs.
- Promote the historical aspect of Koror State's RISL visitor experience.
  - ❖ By 2015, guidelines and training for tour operators has been developed concerning historical sites, and incorporated into tourist guide training.
- ❖ Strengthen and enhance the natural aspect of the RISL visitor experience.
  - ❖ By 2016 new nature-based tourism ventures are under development, particularly regarding the opportunity to build a bird-watching tourist market.
- Maintain local resident access to the RISL and enhance the local Palauan visitor experience/ recreational use.
  - ❖ By 2016 facilities at key local only sites have been constructed and/ or improved.
  - ❖ By 2016 develop best management practices for local site use.
- ❖ By 2016, develop and enhance regulations and monitoring to ensure that development in the RISL is strictly controlled, while allowing necessary infrastructure to support better management of the area.
- ❖ By 2016 develop/enhance regulations and monitoring for development in and around Koror to minimize degradation and pollution impacts in the RISL.
- ❖ By 2016 regulations and guidelines have been developed to ensure boating safety and minimize the impact of boating activities in RISL waters, including the mooring of vessels.

#### **Goal 5: Koror State Government Institutional Capacity Building**

- ❖ By 2016, regulatory and legislative frameworks for management in the RISL have been reviewed and, where appropriate, improved.
- ❖ By 2016 the capacity of Koror State Government to effectively carry out enforcement and surveillance activities in the RISL has been enhanced.
- ❖ By 2016, Koror State Government has worked to strengthen relationships and communication with organizations involved in the implementation of activities, and with key stakeholders/ resource users.
- ❖ By 2016 establish links with other management programs at a national, regional and international level to better manage the RISL.

# Management Objectives and Activities

## Goal 1: Biodiversity/ Natural System Health Enhancement

### Objectives and Associated Actions

#### Objective:

- ❖ By 2015 essential fish habitats (sea grass, coral reefs and mangroves) for valuable food fish in the RISL are mapped and surveyed.

#### Activities:

- ❖ Partner with PICRC and other agencies to conduct survey of essential fish habitats for valuable food fish species.
  - ❖ Focus on highlighting critical, high diversity and degraded habitats.
  - ❖ Focus on fish spawning aggregations.

#### Objective:

- ❖ By 2016 management in the RISL is informed by data, such as the findings and recommendations of the Essential Fish Habitat surveys and monitoring of existing MPAs.

#### Activities:

- ❖ Develop specific action plans for habitats showing degradation or poor health.
- ❖ Monitor species health and abundance to assess the effectiveness of existing MPAs.

#### Objective:

- ❖ By 2016 biological baseline data within the RISL has been developed, focusing on key terrestrial and marine species.

#### Activities:

- ❖ By 2015 create a database of all relevant scientific knowledge about the RISL to identify critical knowledge gaps and use existing data to inform policy.
- ❖ Conduct turtle nesting and population surveys.
- ❖ Conduct dugong population survey.
- ❖ Conduct survey of sea cucumber populations.
- ❖ Co-ordinate with Sustainable Decisions regarding the 2012 cetacean survey data.
- ❖ Conduct bird diversity survey in the RISL.
  - ❖ Emphasis on megapodes.
  - ❖ To be used as an indication of overall RISL biodiversity and ecosystem health.
- ❖ Conduct vegetation survey in the RISL.
  - ❖ Focus on rare and/or endemic species.
- ❖ Assess and regularly monitor the distribution and area covered by invasive plant species on the Rock Islands.
- ❖ Conduct survey of major invasive terrestrial and marine species.

- ❖ Conduct ant diversity survey in the RISL.
  - ❖ Can be used as a biodiversity/ ecosystem health indicator.

**Objective:**

- ❖ By 2016 protected areas have been created in the RISL to maintain the health of key species.

**Activities:**

- ❖ Establish a “wildlife preservation reserve” at Kmekumer Islands for the protection of Hawksbill nesting beaches, nesting turtles and eggs.
- ❖ Establish a protected area for known spawning site for kemedukl (humphead parrot fish).

**Objective:**

- ❖ By 2016 strategies have been developed to enhance the resilience of ecosystems in the RISL to climate change.

**Activities:**

- ❖ Partner with PICRC and other agencies to develop an early warning system for coral bleaching and other natural events.
  - ❖ Conduct research on key stresses/ threats from climate change.
  - ❖ Conduct research to identify early warning indicators.
  - ❖ Conduct research into the resilience of ecosystems.
    - ❖ Partner with PICRC and other agencies regarding current coral genetics and connectivity research.
  - ❖ Develop response strategy based on data.
- ❖ Reduce existing (non-climatic) pressures on ecosystems to enhance resilience to future stress.
  - ❖ Conduct research to assess current stresses and threats to ecosystems, and conduct vulnerability assessments.
  - ❖ Create action plans to reduce identified stresses.
- ❖ Identify best management practices for dealing with shoreline erosion in other similar ecosystems, and investigate the feasibility of implementing action plans based on these BMPs.
- ❖ Continue support of the long-term program to monitor shoreline erosion.

**Objective:**

- ❖ By 2016 strategies and plans have been developed and implemented to prevent the establishment of new marine or terrestrial invasive species, and reduce the distribution and area covered by existing invasive species in the RISL.

**Activities:**

- ❖ Develop and implement programs to manage/control invasive species in the RISL, including reporting systems and response strategies.
  - ❖ Develop specific plan for management of the cockatoo populations in the RISL.
  - ❖ Continue to support efforts to remove Crown of Thorns Starfish from selected reefs. Methods should incorporate the latest research findings, such as timing

efforts before Crown of Thorns Starfish spawn, and include a density “trigger” to initiate clean-up efforts.

- ❖ Train the rangers and beach boys to identify and remove invasive terrestrial plant species, particularly from tourist areas and areas around summer houses.
- ❖ Continue rat control programs in the RISL to reduce rat populations.
- ❖ Remove invasive plant species from the Management Area and regularly re-visit areas to monitor for and remove new growth.
- ❖ Utilize hunters to regularly cull introduced cockatoo and parrot populations in the Management Area.
- ❖ Develop outreach and education programs to increase awareness of all regulations relating to plants and animals of the Rock Islands.

## **Goal 2: Subsistence and Commercial Fisheries Improvement**

### **Objectives and Associated Actions**

#### **Objectives:**

- Ensure fisheries are sustainable by decreasing overall fishing pressure in the RISL.
  - ❖ By 2016 Koror State Government has developed the institutional capacity to manage and regulate fisheries.
  - ❖ By 2016 subsistence and commercial fishing and other extractive activities in the RISL are guided by zones and associated regulations.

#### **Activities:**

- ❖ Develop/enhance regulations for subsistence, customary and commercial harvesting of fish and invertebrates in the appropriate zones.
  - ❖ Develop harvesting restrictions for giant clams (e.g. through size and bag limits, moratorium on some species). Develop State regulations for fishing gear and practices (eg. net types) to address gaps in national regulations.
- ❖ Develop a Fisheries Impact Assessment (FIA) procedure for Koror State.
- ❖ Create fisheries zones in the RISL.
  - ❖ Designate invertebrate no-harvesting zones in the RISL.
  - ❖ Designate a recreational fishing tourist zone to limit the impacts by visitors.
  - ❖ Create clear no-take zones informed by the findings of the Essential Fish Habitat Survey and other information on critical/breeding habitat.
- ❖ Create guidelines for fishing tournaments, including exemptions to the usual zones.
- ❖ Maintain the ban on commercial fishing within the reef by foreign-owned fishing businesses and joint-commercial fishing ventures with foreign fishermen.
- ❖ Continue annual monitoring of fish and invertebrates at Ngederrak reef and control sites (non-protected reefs outside Ngederrak) to assess the effectiveness of protected areas.
- ❖ Publicize harvesting regulations and conservation areas through brochures, posters, maps, newspaper, radio, television, and presentations and signs on docks or other public places.
- ❖ Develop and implement targeted awareness and education programs for resource users (including tourists) to increase their knowledge and understanding of the importance of fish resources and the reasons for regulations and restrictions, particularly focusing on the benefits of no-take zones to fisheries.

**Objective:**

- ❖ By 2016 best management practices for key species are developed, including sustainable harvest rates and reseeded programs.

**Activities:**

- ❖ Partner with PICRC and Bureau of Marine Resources to undertake research into sustainable harvest levels, focusing on:
  - ❖ CPUE over time.
  - ❖ Size and abundance of fish populations.
- ❖ Models of sustainable harvest rates are developed for key species based on the fisheries survey data.
- ❖ Investigate the feasibility of reseeded programs for rabbit-fish.
- ❖ Create a reseeded program for giant clams.
- ❖ Create guidelines for captive breeding programs supplying reseeded stock, to limit negative genetic impacts.

**Objective:**

- ❖ By 2016 aquaculture projects are in accordance with Koror State Government aquaculture zones and regulations.

**Activities:**

- ❖ Develop aquaculture zones.
  - ❖ Contain aquaculture within existing areas.
- ❖ Assess the number and status of existing aquaculture sites.
- ❖ Develop regulations for Koror State.
  - ❖ By 2016 no new aquaculture sites can be developed.
  - ❖ Ensure aquaculture projects are in accordance with state regulations.
  - ❖ Develop water quality standards.
  - ❖ Make it a requirement for all new aquaculture projects to undergo an FIA before approval.
- ❖ Work with the EQPB to ensure consistent water quality monitoring of the aquaculture sites.
- ❖ Create guidelines that require aquaculture enterprises to be self-regulating industries.

## **Goal 3: Cultural and Historical Preservation**

### **Objectives and Associated Actions**

- Strengthen and enhance Koror State's traditional and cultural connection to the RISL stone work villages, and preserve historic sites within the RISL.

**Objective:**

- ❖ By 2014 protocols and plans are developed for maintaining and rehabilitating stonework village sites and features in the RISL.

**Activities:**

- ❖ Work with BAC to develop protocols for maintaining and rehabilitating stonework village sites.
- ❖ Establish a timetable/action plan for the inclusion of the remaining unregistered village and rock-art sites in the RISL world heritage nomination.

**Objective:**

- ❖ By 2016 village sites that are in critical need of care or rehabilitation have been identified, mapped and a plan for their rehabilitation developed.

**Activities:**

- ❖ Conduct survey to identify village sites.
- ❖ Prioritize village sites for rehabilitation.
- ❖ Map and document village sites.
- ❖ Register key cultural village sites.
- ❖ Koror State Community and Cultural Affairs department work with Bureau of Arts and Culture to develop a plan to rehabilitate village sites, and build capacity to implement the plan.
- ❖ Develop and implement communication outreach on efforts.

**Objective:**

- ❖ By 2015 50% of the traditional cheldebechel of Koror have access to information on and value the importance of the RISL to Koror's cultural heritage.

**Activities:**

- ❖ Conduct social survey in 2013 to gauge awareness about the RISL's cultural value (partner with organizations such as PCS to conduct this survey).
- ❖ Develop awareness materials/education programs for the RISL.
- ❖ Implement outreach activities (radio, TV, community activities etc) in partnership with established programs such as PCS, PVA, PICRC.
- ❖ Incorporate cultural traditional place names and species names into maps, signage and everyday use to revive the traditional bond to places (as opposed to foreign/ English names currently used).
  - ❖ Work with traditional leaders to document place names and create new names for areas.
  - ❖ Consider a revision of the name of the RISL, to reflect cultural values, and a name that is Palauan.
- ❖ Expand on existing youth and school programs and to include more activities and information related to the RISL's cultural value.
- ❖ Conduct social survey in 2016 to assess if people's awareness about the RISL's cultural value has increased.

**Objective:**

- ❖ By 2016 key historical sites in the RISL (i.e. WWII wrecks) have been identified, mapped and a plan for their preservation developed.

**Activities:**

- ❖ Conduct survey to identify key historical sites and their current state, including the presence of any unexploded ordnance from WWII sites.
- ❖ Map and document historical sites.
- ❖ Register key historical sites.
- ❖ Develop a plan to preserve and or/ increase the safety of Palau's historic sites, including:
  - ❖ Arrange for the removal of unexploded ordnance from WWII sites.



- ❖ Develop guidelines so that any work done by outside organizations/ Governments is done with prior Koror State approval, and information is reported back.

**Objective:**

- ❖ By 2016, a section depicting RISL and Koror State cultural traditions and historic era is established at the Belau National Museum.

**Activities:**

- ❖ Work with the BNM and other relevant agencies to gather information, stories and pictures about the cultural traditions in the RISL, and create cultural heritage exhibits.
- ❖ Work with the BNM and other relevant agencies to collect information and pictures about the RISL's historic era, collect removed historic artifacts such as exploded ordnance, and create exhibits.

## **Goal 4: Tourism, Recreation and Economic Enhancement**

### **Objectives and Associated Actions**

**Objectives:**

- Enhance tourism guidelines and regulations and ensure that tourism operators and tourist guides are in compliance with these.
- ❖ By 2014 all tour operators are familiar with and are implementing tours according to the tour guide certification program.

**Activities:**

- ❖ Implement tour guide certification program for tour guides by 2013.
- ❖ Review and enhance tourism regulations, guidelines and standards.
  - ❖ Ensure all tour guides have adequate English and/or Palauan language skills.
  - ❖ Establish regulations by 2014 for Ongeim'l Tketau, Jellyfish Lake.
- ❖ Conduct survey in 2015 of current tour operators and tour guides to assess awareness and adherence to tourism guidelines.
- ❖ Create enforcement and monitoring programs to ensure that tour operators are in compliance with regulations.
  - ❖ Create specific tourism enforcement positions within the Koror State Rangers program, where staff are responsible for regular monitoring of tour groups.
  - ❖ Create a fine system for non-compliance to regulations and negative practices.
- ❖ Create an incentive program, including an award system, for tour operators to reward good operating practices.
- ❖ Work with PCS and other organizations to publicize tourist activity areas and regulations, including Rock Island Use Permit information, through brochures, maps, posters, and publications such as the "Alii" visitor magazine, radio, and television.

**Objective:**

- ❖ By 2016 tour operation guidelines and plans to ensure sustainable and low impact tourism have been developed.

**Activities:**

- ❖ Develop guidelines and regulations which minimize visitor impacts on tourist sites including:
  - ❖ Rotational systems of tourist area use.

- ❖ Designate new tourist sites to allow for rotational site use and to reduce the pressure on existing sites.
- ❖ Temporary/ seasonal site closure.
- ❖ Restrictions on tourist numbers/ tour boat numbers.
- ❖ Regulate diving and snorkeling activities in the Management Area to reduce site congestion and damage to corals, and increase site safety.
  - ❖ Assign scuba certification levels for key dive sites.
- ❖ Regulate diving at Ngerumekaol (Ulong Channel) and other fish spawning sites during critical spawning times (10 days before the new moon from May to August) to minimize disruption of spawning activities.
- ❖ Control fish feeding activities.
  - ❖ Limit fish feeding sites.
  - ❖ Control the amount and type of food given.
- ❖ Partner with PICRC and other agencies to conduct environmental surveys/ research to assess:
  - ❖ Environmental impacts of tourism in the RISL.
    - ❖ Conduct regular monitoring of key dive sites to assess long-term impacts from divers and snorkelers.
    - ❖ Encourage and support research to determine the impacts of diver disturbance on grouper spawning activities.
  - ❖ Environmental health of newly proposed sites.
  - ❖ Carrying capacity of sites.
  - ❖ Seasonal vulnerability of important species within sites.
- ❖ Continue socio-economic surveys of tourism use in the RISL.
- ❖ Create and enforce guidelines for future development/construction of tourist facilities, including energy use and supply.
- ❖ Ensure newly developed tourist sites are multi-purpose, to limit the number of new sites needed, thereby limiting the impact of development in the RISL.
  - ❖ Eg. Develop new cultural sites in conjunction with new bird-watching tourism.
- ❖ Explore feasibility of developing a special 'eco-friendly operator accreditation' to reward environmentally conscious operations, including restaurants that comply with wildlife regulations (with any breach of regulations resulting in loss of accreditation).
- ❖ Work with PCS to develop educational and awareness material for tourists and locals explaining the environmental and cultural significance of the Rock Islands-Southern Lagoon Area and how they can help protect it.
  - ❖ Develop a litter awareness campaign to encourage all visitors to the Management Area to reduce the amount of trash they produce and take all trash with them when they leave, including food scraps and cigarette butts, and reasons why.

### **Objectives:**

- Strengthen and enhance the cultural aspect of Koror State's RISL visitor experience.
  - ❖ By 2015 the cultural heritage of at least 5 tourism sites have been identified and developed as part of the RISL visitor experience.
  - ❖ By 2014 cultural heritage training for tour guides has been developed and incorporated into tourist guide training.
  - ❖ By 2016 at least 25% of tour operators in the RISL have integrated traditional cultural resource tours into their tour programs.

### **Activities:**

- ❖ Identify and map cultural sites.
- ❖ Build infrastructure to support visitors.
- ❖ Develop cultural heritage tourism guidelines and training.
- ❖ Develop cultural site maintenance plan.
  - ❖ Locate visitor arrival points and facilities away from the immediate environs of cultural site to minimize site degradation from trash dumping, foot traffic and the construction and maintenance of tourist structures.
- ❖ Develop interpretive and other signage in the Palauan and English languages to educate and inform visitors about the site and appropriate behavior within the site.
- ❖ Promote the importance and value of cultural heritage tours to operators.
  - ❖ Conduct FAM tours for operators.
- ❖ Work with PVA, BTA and others to promote cultural heritage tours to visitors.
- ❖ Conduct survey in 2016 to assess the number of tour operators which have integrated traditional cultural resource tours into their programs, and their adherence to tour guide training recommendations.

### **Objectives:**

- Promote the historical aspect of Koror State's RISL visitor experience.
  - ❖ By 2015, guidelines and training for tour operators has been developed concerning historical sites, and incorporated into tourist guide training.

### **Activities:**

- ❖ Identify and map historical sites.
- ❖ Develop historical tourism guidelines and training, and incorporate into tourist guide training.

### **Objective:**

- Strengthen and enhance the natural aspect of the RISL visitor experience.
- ❖ By 2016 new nature-based tourism ventures are under development, particularly regarding the opportunity to build a bird-watching tourist market.

### **Activities:**

- ❖ Work with BNM and PVA to develop bird-watching tourism in the RISL, including:
  - ❖ Tours in the RISL dedicated to bird-watching.
  - ❖ Tour operating guidelines and training specific to bird-watching.
  - ❖ An assessment of suitable sites for bird-watching.
  - ❖ Creation of new pathways, infrastructure, information signs, and species checklists for bird-watching sites.
    - Note: this may be done in conjunction with the development of other new tourist sites, eg. cultural sites.
- ❖ Co-ordinate with PVA to create tourist information dedicated to bird-watching.

### **Objective:**

- Maintain local resident access to the RISL and enhance the local Palauan visitor experience/ recreational use.
  - ❖ By 2016 facilities at key local only sites have been constructed and/ or improved.
  - ❖ By 2016 develop best management practices for local site use.

### **Activities:**

- ❖ Identify new areas which could be developed as local recreational sites and establish facilities.
- ❖ Assess the accessibility and quality of facilities at local only sites, and develop a plan to construct and/or improve site facilities where necessary.
- ❖ Develop BMPs for local site use including:
  - ❖ Waste disposal.
  - ❖ Facilities use.
  - ❖ Regulations on what can be brought in and out (i.e. no plants and animals to be brought in).
  - ❖ Interactions with wildlife.
  - ❖ Anchoring and mooring of boats.
- ❖ Develop an education and outreach program to increase awareness about BMPs and the importance of respectful site use.

**Objectives:**

- ❖ By 2016, develop and enhance regulations and monitoring to ensure that development in the RISL is strictly controlled, while allowing necessary infrastructure to support better management of the area.

**Activities:**

- ❖ Review and strengthen regulations to strictly control any future development in the RISL, in accordance with the zones.
- ❖ Officially designate a Special Management Zone (SMZ) within the RISL which includes the sand mining operation site, aquaculture sites, and Dolphins Pacific.
  - ❖ Regulate and control development within the Special Management Zone.
  - ❖ Work with EQPB to establish strict controls and no-expansion limits for the current sand mining operation within the SMZ.
  - ❖ Establish a minimum water quality standard for the SMZ.
  - ❖ Establish measures to mitigate the impacts of activities that violate the minimum water quality standards, including fines.
- ❖ For all areas in the RISL outside of the SMZ development will be strictly controlled and limited to the construction of low-impact facilities.
  - ❖ Work with the Department of Public Works to create guidelines for construction and building of small scale facilities in the RISL.

**Objective**

- ❖ By 2016 develop/enhance regulations and monitoring for development in and around Koror to minimize degradation and pollution impacts in the RISL.

**Activities:**

- ❖ Create a Koror State reporting system and review process for all proposed development activities in Koror State.
- ❖ Work with relevant agencies to ensure that development in Koror is in adherence with regulations and the EIA process.
- ❖ Partner with relevant agencies to conduct research/monitoring into the impacts of the Malakal sewage outfall on the marine environment.
- ❖ Partner with relevant agencies to conduct more detailed monitoring/research to determine the impacts of the M-dock rubbish dump on the surrounding ecosystem (plants and animals).

**Objectives:**

- ❖ By 2016 regulations and guidelines have been developed to ensure boating safety and minimize the impact of boating activities in RISL waters, including the mooring of vessels.

**Activities:**

- ❖ Establish regulations for vessels entering and mooring in Koror State waters.
  - ❖ Create partnerships with relevant agencies to manage visitor boat numbers/traffic and improve existing regulations for motorboat registration.
  - ❖ By 2015 conduct a socio-economic assessment on waste disposal for resident and visitor vessels.
  - ❖ Create waste disposal regulations and fees.
- ❖ Establish and promote regulations for anchoring to reduce the loss and degradation of coral reefs. Develop a formal procedure and task force (including PICRC, EQPB, AG, States) to deal with ship groundings within the State (including legislation if necessary).
- ❖ Develop a formal procedure to deal with oil spills within the State.
- ❖ Establish standard search and rescue procedures within the State.
- ❖ Work with the National Government to develop a boat operator's license.
- ❖ Define boat channels and/ or implement speed restrictions in areas that have high boat activity, diving/snorkeling activities occur, are ecologically significant or sensitive to erosion.
- ❖ Develop and implement comprehensive water safety regulations for Koror State, including safety equipment requirements, and limiting passenger number on boats, to increase the safety and quality of all water activities and tours in the Management Area.
- ❖ Identify partners to help with the removal of abandoned vessels.

## **Goal 5: Koror State Government Institutional Capacity Building**

### **Objectives and Associated Actions**

**Objective:**

- ❖ By 2016, regulatory and legislative frameworks for management in the RISL have been reviewed and, where appropriate, improved.

**Activities:**

- ❖ Review and update the effectiveness of current regulations relating to management in the RISL.
  - ❖ Fishing license.
  - ❖ Rock Island Conservation Act.
  - ❖ Amend Koror State Public Law No. K6-121-2001 regarding the monetary value of damage to coral reef ecosystems located in Koror State's Waters, to include the use of settlement funds to cover legal costs and site restoration efforts (if required), and develop regulations to enforce the act.
  - ❖ Amend boating regulations and licensing.
  - ❖ Municipal ordinance 49/69.
  - ❖ Repeal the curfew law.
  - ❖ Amend the air rifle regulations.
- ❖ Identify gaps/weakness in current regulations and work to create new legislation and regulations.

- ❖ Develop and implement new regulations identified in goals 1-4.
- ❖ Control the consumption of alcohol in the RISL.
- ❖ Create a mandate requiring that all research in the RISL is reported to a centralized database.
- ❖ Create procedural guidelines for dealing with emergency situations.
- ❖ Identify where there are exemptions to the regulations, and ensure that there are strict guidelines where this applies. For example:
  - ❖ Ensure that all harvesting of timber in the RISL in cases exempted from the ban (i.e. for cultural purposes) are approved by the Traditional Leadership and follow State Government guidelines.

**Objective:**

- ❖ By 2016 the capacity of Koror State Government to effectively carry out enforcement and surveillance activities in the RISL has been enhanced.

**Activities:**

- ❖ Review the effectiveness of the enforcement and surveillance activities. Maintain all effective enforcement activities, and where regulations are not being adhered to, assess strategies to improve enforcement.
  - ❖ Work with Peleliu State to develop regulations to protect important cross-border areas, such as the German Channel, by coordinating and supporting enforcement of regulations in Koror and Peleliu waters.
  - ❖ Full implementation of Ngemelis Outpost and replication at other sites
  - ❖ Establish database for boat registration/visiting vessels, citations, aquaculture, research permits.
  - ❖ Establish a secure VHF channel.
- ❖ Improve the capacity of Koror State Conservation and Law Enforcement to carry out enforcement and surveillance activities.
  - ❖ Review and improve the training of State Rangers.
  - ❖ Ensure adequate staffing and technical support.
    - ❖ Ensure adequate capacity so that other commitments, such as monitoring community events, do not interfere with operational capabilities within the RISL.
  - ❖ Deputize select Rangers to enhance enforcement authorities.
  - ❖ Establish Standard Operating Procedures (SOPs).
  - ❖ Establish a department-wide staff ranking system.
  - ❖ Ensure adequate equipment (such as GPS, cameras, scuba gear), transportation, and expand facilities.
- ❖ Develop procedures for permitting processes and exemptions (eg. visitor permits, filming permits).

**Objective:**

- ❖ By 2016, Koror State Government has worked to strengthen relationships and communication with organizations involved in the implementation of activities, and with key stakeholders/ resource users.

### **Activities:**

- ❖ Identify organizations which will be implementing specific activities, and engage them to carry out required tasks.
  - ❖ Establish MOAs with organizations involved in the implementation of activities.
- ❖ Strengthen the partnership with key organizations which will be instrumental in the long-term management of the RISL.
- ❖ Work with key organizations to ensure they have sufficient capacity to carry out tasks by the dates required.
- ❖ Develop protocols for issues which are cross-jurisdictional and involve several departments or levels of Government.
- ❖ Work to strengthen the communication between internal and external key partners, including the sharing of key information/data.
  - ❖ Work to develop a database for all information relevant to the RISL.
- ❖ Strengthen the relationship with tour operators (who are instrumental in goal 4), including:
  - ❖ Continue to strengthen communication and cooperation between Koror State and tour-operators through regular meetings, and liaison with tour groups.
  - ❖ Work with tour-operators to develop a coral reef monitoring program to assess diver and snorkeler impacts on key dive and snorkel sites, increase environmental awareness, and strengthen relationships between the government and tourism industry.
- ❖ Strengthen the relationship with fisheries co-operatives and fishermen associations.
- ❖ Identify key stakeholders/ resources users for the RISL Management Area, and work to include them in the management process.
  - ❖ By 2013 conduct socio-economic surveys.
  - ❖ By 2014 involve identified stakeholders in the 2 year review process/ community consultation.

### **Objective:**

- ❖ By 2016 establish links with other management programs at a national, regional and international level to better manage the RISL.

### **Activities:**

- ❖ By 2013 designate Ngerumekaol Protected Area and Ngerukewid Islands Wildlife Preserve to become part of PAN.
- ❖ By 2013 develop the administrative capacity to meet requirements as a UNESCO World Heritage Site, including reporting.
  - ❖ Coordinate with PICRC, BMR and other organizations for monitoring and reporting required by UNESCO.
- ❖ Investigate the feasibility of linking the RISL to other regional and international conservation programs.



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NCU: 12-003  
28 February 2012

Mr. Kishore Rao  
Director  
World Heritage Center  
7, place de Fontenoy  
75352 Paris 07 SP France

Dear Mr. Rao,

Greetings and I hope this letter finds you well. Enclosed is the final version of the Palau dossier nominating the Rock Island Southern Lagoon to the World Heritage List. This nomination is scheduled to go before the WH Committee in June of this year. We have been asked by the two advisory bodies, IUCN and ICOMOS to provide additional information which we felt were necessary to make changes and amendments to the nomination file.

I understand that we have to provide three hard copies and they have been put in the mail and are on their way to the WH Center. But we wanted to send you the digital version so that it can be received on the 28<sup>th</sup> thus meeting the deadline. We do wish to advise that all the appendices have already been sent to you with the original version of the dossier. Therefore, we didn't send any this time except for the maps.

I trust that you will find the nomination file complete and ready to be reviewed by the Advisory Bodies for their recommendations. The RISL is a mixed nomination and we are hopeful that it will be recommended for inscription. Should there be additional information needed, please let us know and we will gladly provide.

I want to thank you and the WH Center for your continued assistance and support towards this milestone achievement for Palau.

Most sincerely,

Dwight G. Alexander  
Secretary General  
Palau National Commission for UNESCO

Attachments

xc: Jung Young Hun, World Heritage Center



Hon. Faustina Rehuher Marugg, Minister of Community & Cultural Affairs  
Dwight G. Alexander, SG., Palau Natcom



United Nations  
Educational, Scientific and  
Cultural Organization

Organisation  
des Nations Unies  
pour l'éducation,  
la science et la culture

Organización  
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Организация  
Объединенных Наций по  
вопросам образования,  
науки и культуры

منظمة الأمم المتحدة  
للتربية والعلم والثقافة

联合国教育、  
科学及文化组织

## The Culture Sector World Heritage Centre

Hon. Masa-Aki Emesiochl  
Chairperson  
National Commission of the  
Republic of Palau for UNESCO  
C/O Ministry of Education P.O Box  
1526 Koror Palau

Ref: CLT/WHC/PSM/12/LJ/APA/228 16 August 2012

Subject: **Inscription of *Rock Islands Southern Lagoon* (CN 1386), Palau,  
on the World Heritage List**

Sir,

I have the pleasure to inform you that the World Heritage Committee, at its 36th session (Saint Petersburg, Russian Federation, 24 June – 6 July 2012), examined the nomination of the ***Rock Islands Southern Lagoon*** and decided to **inscribe** the property on the World Heritage List. The decision of the Committee concerning the inscription is attached.

I am confident that your government will take the necessary measures for the effective conservation of this new World Heritage property. The World Heritage Committee and its Secretariat, the World Heritage Centre, will do everything possible to collaborate with you in these efforts.

The *Operational Guidelines for the Implementation of the World Heritage Convention* (paragraph 168), request the Secretariat to send to each State Party with a newly inscribed property a map of the area(s) inscribed. Please examine the attached map and inform us of any discrepancies in the information by **1 December 2012**.

The inscription of the property on the World Heritage List is an excellent opportunity to draw the attention of visitors to, and remind local residents of, the *World Heritage Convention* and the outstanding universal value of the property. To this effect, you may wish to place a plaque displaying the World Heritage emblem and the UNESCO logo at the property. You will find suggestions on this subject in the *Operational Guidelines for the Implementation of the World Heritage Convention*.

In many cases States Parties decide to hold a ceremony to commemorate the inscription of a property on the World Heritage List. Upon request to the World Heritage Centre by the State Party, a World Heritage Certificate can be prepared for such an occasion.

I would be grateful if you could provide me with the name, address, telephone and fax numbers and e-mail address of the person or institution responsible for the management of the property so that we may send them World Heritage publications.

Please find attached the brief descriptions of your site, prepared by ICOMOS, IUCN and the World Heritage Centre, in both English and French. As these brief descriptions will be used in later publications, as well as on the World

Heritage website, we would like to have your full concurrence with their wording. Please examine these descriptions and inform us, by **1 December 2012** at the latest, if there are changes that should be made. If we do not hear from you by this date, we will assume that you are in agreement with the text as prepared.

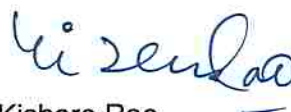
Furthermore, as you may know, the World Heritage Centre maintains a website at <http://whc.unesco.org/>, where standard information about each property on the World Heritage List can be found. Since we can only provide a limited amount of information about each property, we try to link our pages to those maintained by your World Heritage property or office, so as to provide the public with the most reliable and up-to-date information. If there is a website for the newly inscribed property, please send us its web address.

All the Decisions adopted by the 36th session of the World Heritage Committee are available at the following web address of the World Heritage Centre:  
<http://whc.unesco.org/archive/2012/whc12-36com-19e.pdf>.

As you know, according to paragraph 172 of the *Operational Guidelines for the Implementation of the World Heritage Convention*, the World Heritage Committee invites the States Parties to the *Convention* to inform the Committee, through the World Heritage Centre, of their intention to undertake or to authorize in the area protected under the *Convention* major restorations or new constructions which may affect the outstanding universal value of the property.

May I take this opportunity to thank you for your co-operation and for your support in the implementation of the *World Heritage Convention*.

Please accept, Sir, the assurances of my highest consideration.



Kishore Rao  
Director

cc: National Commission of Palau for UNESCO  
ICOMOS, IUCN

**Decision: 36 COM 8B.12**

The World Heritage Committee,

1. Having examined Documents WHC-12/36.COM/8B, WHC-12/36.COM/INF.8B1 and WHC-12/36.COM/INF.8B2,
2. Inscribes the **Rock Islands Southern Lagoon, Palau**, on the World Heritage List on the basis of **criteria (iii), (v), (vii), (ix) and (x)**;
3. Adopts the following Statement of Outstanding Universal Value:

**Brief synthesis**

The Rock Islands Southern Lagoon consists of numerous large and small forested limestone islands, scattered within a marine lagoon protected by a barrier reef. The property lies within Koror State, immediately to the south of Palau's main volcanic island Babeldaob in the western Pacific Ocean.

The marine site covers 100,200 ha and is characterized by coral reefs and a diversity of other marine habitats, as well as 445 coralline limestone islands uplifted due to volcanism and shaped over time by weather, wind and vegetation. This has created an extremely high habitat complexity, including the highest concentration of marine lakes in the world, which continue to yield new species discoveries. The terrestrial environment is lush and at the same time harsh, supporting numerous endemic and endangered species. Although presently uninhabited, the islands were once home to Palauan settlements, and Palauans continue to use the area and its resources for cultural and recreational purposes. This is regulated through a traditional governance system that remains an important part of national identity.

The islands contain a significant set of cultural remains relating to an occupation over some five thousand years that ended in abandonment. Archaeological remains and rock art sites are found in two island clusters - Ulong and Negmelis, and on three islands - Ngeruktabel, Ngeanges, and Chomedokl.

Remains of former human occupation in caves, including rock art and burials, testifies to seasonal human occupation and use of the marine ecosystem, dating back to 3,100 BP and extending over some 2,500 years.

Permanent stone villages on a few islands, some dating back to between 950 and 500 BP, were occupied for several centuries before being abandoned in the 17th-18th centuries, when the population moved to larger islands. The villages include the remains of defensive walls, terraces and house platforms. The settlements reflect distinctive responses to their local environment and their abandonment demonstrates the consequences of population growth and climate change impacting on subsistence in a marginal environment.

The descendants of the people who moved from the Rock Islands to the main islands of Palau identify with their ancestral islands through oral traditions that record in legends, myths, dances, and proverbs, and traditional place names the land- and seascape of their former homes.

The abandoned islands now provide an exceptional illustration of the way of life of small island communities over more than three millennia and their dependence on marine resources. They also are seen as ancestral realms by the descendants of those who migrated to the main island of Palau and this link is kept alive through oral traditions.

**Criterion (iii):** The Rock Islands cave deposits, burials, rock art, abandoned remains of stonework villages and middens bear exceptional testimony to the organisation of small island communities and their harvesting of marine resources over some three millennia.

**Criterion (v):** The abandonment of Rock Island villages in the 17th and 18th centuries demonstrated by the remains of human settlement and evidence of marine harvesting activity in the Rock Islands Southern Lagoon is an exceptional illustration of the intersection and consequences of climate change, population growth, and subsistence behaviour on a society living in a marginal marine environment.

**Criterion (vii):** The Rock Islands Southern Lagoon contains an exceptional variety of habitats within a relatively limited area. Barrier and fringing reefs, channels, tunnels, caves, arches, and coves, as well as the highest number and density of marine lakes in the world, are home to diverse and abundant marine life. The maze of dome-shaped and green Rock Islands seemingly floating in the turquoise lagoon surrounded by coral reef is of exceptional aesthetic beauty.

**Criterion (ix):** The Rock Islands Southern Lagoon contains 52 marine lakes, more than at any other site in the world. Furthermore, the marine lakes of the property are at different stages of geological and ecological development, ranging from lakes with high connectivity to the sea to highly isolated lakes with notably different species composition, including unique and endemic species. These features represent an outstanding example of how marine ecosystems and communities develop, and make the lakes valuable as "natural laboratories" for scientific study of evolution and speciation. Five new subspecies of the *Mastigias papua* jellyfish have been described from these marine lakes, and new species discoveries continue to be made both in the marine lakes as well as in the complex reef habitats of the property.

**Criterion (x):** The Rock Islands Southern Lagoon has exceptionally high biological and marine habitat diversity. The marine lakes are unique in terms of number, the density at which they occur, and their varying physical conditions. With low fishing pressure, limited pollution and human impact, as well as an exceptional variety of reef habitat, the resilience of reefs of the property makes it a critical area for protection, including as an area important for climate change adaptation of reef biota, and potentially as a source of larvae for reefs in the region. All the endangered megafauna of Palau, 746 species of fish, over 385 species of corals, at least 13 species of sharks and manta rays, 7 species of giant clams, and the endemic nautilus are found in the property, and the forests of the islands include all of Palau's endemic birds, mammals, herpetofauna and nearly half of Palau's endemic plants. This makes the area of exceptional conservation value.

### **Integrity**

The property has clear boundaries and includes a large part of the lagoonal and reef habitat surrounding the main islands of Palau, as well as most land of coralline origin occurring within Koror State. This ensures a high degree of replication of habitat type. Although past and present use has altered both marine and terrestrial environments, or at least the abundance of resource species, the present conservation status of the property is good. Activities in and around the property that may impact on it are subject to specific management regulations and/or interventions. The inclusion of waters outside the barrier reef and within Koror State jurisdiction in a buffer zone further increases its ecological integrity.

The property contains a complete representation of the features and processes that convey the value of the property. Most of these elements do not suffer inordinately from development or neglect and are in good condition. However a conservation programme is required to ensure ongoing conservation and maintenance. The property has been largely isolated from human interference since pre-European occupation ceased. They are nevertheless highly vulnerable to uncontrolled tourism activities.

## **Authenticity**

The form and materials of village settlements, burial caves and their setting continue to convey the cultural value of the property. Excavated deposits have been recorded and reburied, and the reports of these campaigns have been lodged with the Koror State Government. To achieve a full understanding of the remains on all the islands will need more survey work.

Oral histories and ongoing cultural traditions in the main island of Palau keep alive the memories of the migration away from the Rock Islands and the histories associated with them.

## **Protection and management requirements**

The legislative framework regulating use and management of the environment and its resources is comprehensive and clear. The area falls in its entirety in Koror State, and the management jurisdiction of Koror State Rangers is well known and respected. Management authorities are operating on relatively reliable revenue from tourism. The strength of traditional value systems including resource governance systems is an asset, and can enable management and zoning that accommodate both cultural/traditional and biodiversity conservation needs. Management objectives and priorities are defined in the Rock Islands Southern Lagoon Management Plan. Both legislative framework and management arrangements are conducive to protecting and maintaining the values of the property.

Cultural sites within the Rock Islands Southern Lagoon are protected under Title 19 'Cultural Resources' by the Historical and Cultural Preservation Act of the Republic of Palau. Underwater archaeological and historical remains are protected under Title 19 as the 'Palau Lagoon Monument'. All the designated sites within the property should be included on Palau's National Register of historic places.

The Koror State Department of Conservation and Law Enforcement collaborates with the Palau Historic Preservation Office, Bureau of Arts and Culture in working with locally based agencies and organisations on management and research activities within the property. Koror State Regulations (1994) cover general resource use, recreational activities and the designation of protected areas within the Rock Islands Southern Lagoon. The Rock Islands Use Act was legislated in 1997 to regulate tourist activity in the islands. The laws and regulations are enforced by the Koror State Rangers.

The Rock Islands Southern Lagoon Area Management Plan 2004-2008 was adopted by the Koror State Legislature and Governor in 2005 and is currently under review.

Long term protection and management requirements for the property include the need to prevent negative impacts from tourism, including maintaining access restrictions to vulnerable areas, ensuring visitor numbers are within the capacity of the property, and mitigating adverse effects from development of infrastructure and facilities in Koror. Subsistence and recreational fishing taking place within the property and in designated zones require constant monitoring. However, the property may also be constructively used for research on and preservation of traditional knowledge of the marine environment. Additional needs include maintaining restrictions on development, including aquaculture, within the property and in the vicinity of property boundaries. An adaptive approach to management of the property and the provision for effective long term monitoring including ecosystem health and water quality are necessary in order to maintain the resilience of the property in the face of climate change.

4. Commends the State Party for its efforts to sustainably manage the property and safeguard its globally significant biodiversity, spiritual, cultural and recreational values, including through modern/statutory as well as traditional/customary governance approaches, and recommends further development of the direct involvement of key stakeholder groups including the tourism industry in management, as well as close and consistent liaison between state and national authorities in managing the property as a part of the national protected area network;

5. Also commends the State Party for having included all the designated sites within the property on Palau's National Register of historic places, and having developed a database of identified cultural sites within the property, including archaeological sites, caves, burials, rock art, stone money quarries and villages;
6. Requests the State Party to embark on a process to address present and potential future negative impacts of tourism on the property and adjacent areas, including through detailed projection of tourism development, careful mitigation planning as well as options for reducing or restricting visitor numbers in vulnerable areas or in the property as a whole;
7. Encourages the State Party to strengthen and formalize coordination and liaison on science and monitoring in the property among national and overseas organizations, with a view to enhancing the use of such information in the adaptive management of the property;
8. Strongly encourages the State Party to:
  - a) Ensure effective conservation of the values of the property, including but not limited to marine lakes, habitats of unique or threatened species or where new species discoveries continue to be made, as well as particularly important areas such as spawning sites, including through establishment of further strictly protected areas if required,
  - b) Complete and approve the new Management Plan, with the involvement of relevant communities, to include:
    - i. a conservation programme for the cultural sites covering access, monitoring, maintenance, research, consolidation, and any necessary physical protection, and provide a timetable for the implementation of this programme;
    - ii. a tourism management strategy;
    - iii. a risk preparedness strategy;
    - iv. extension of the key monitoring indicators to include a baseline survey of the rock art, and oral histories.
9. Recommends that the State Party give further consideration to changing the name of the property to reflect its cultural value.

**Surface and coordinates of the property inscribed on the World Heritage List by the 36th session of the World Heritage Committee (Saint Petersburg, 2012) in accordance with the *Operational Guidelines*.**

| State Party | Property                     | ID N | Area    | Buffer zone | Centre point coordinates |
|-------------|------------------------------|------|---------|-------------|--------------------------|
| Palau       | Rock Islands Southern Lagoon | 1386 | 100 200 | 164 000     | N7 14 48.93 E134 21 09   |

### **Brief Description in English**

Rock Islands Southern Lagoon covers 100,200 ha and includes 445 uninhabited limestone islands of volcanic origin. Many of them display unique mushroom-like shapes in turquoise lagoons surrounded by coral reefs. The aesthetic beauty of the site is heightened by a complex reef system featuring over 385 coral species and different types of habitat. They sustain a large diversity of plants, birds and marine life including dugong and at least thirteen shark species. The site harbours the highest concentration of marine lakes anywhere, isolated bodies of seawater separated from the ocean by land barriers. They are among the islands' distinctive features and sustain high endemism of populations which continue to yield new species discoveries. The remains of stonework villages, as well as burial sites and rock art, bear testimony to the organization of small island communities over some three millennia. The abandonment of the villages in the 17th and 18th centuries illustrates the consequences of climate change, population growth and subsistence behaviour on a society living in a marginal marine environment.

## Brief Description in French

Ce site de 100 200 hectares compte 445 îlots calcaires inhabités. D'origine volcanique, les îlots ont souvent la forme de champignons entourés de lagons couleur turquoise et de récifs coralliens. La beauté du site est renforcée par un système complexe de récifs comptant 385 espèces de coraux et différents types d'habitat. Ces derniers hébergent une grande variété de plantes, d'oiseaux et d'animaux marins, notamment des dugongs et au moins treize espèces de requins. Le site représente la plus grande concentration de lacs marins au monde. Ces masses d'eau de mer, isolées de l'océan par une barrière terrestre, sont caractéristiques de ces îles et se traduisent par un endémisme élevé qui peut laisser espérer la découverte de nouvelles espèces. Les vestiges des villages en pierre, ainsi que l'art rupestre et les sépultures, apportent un témoignage exceptionnel sur l'organisation des communautés des petites îles pendant plus de trois millénaires. L'abandon des villages des îles Chelbacheb aux XVIIe et XVIIIe siècles illustre les conséquences du changement climatique, de l'essor démographique et du comportement de subsistance dans une société vivant dans un environnement marin marginal.



