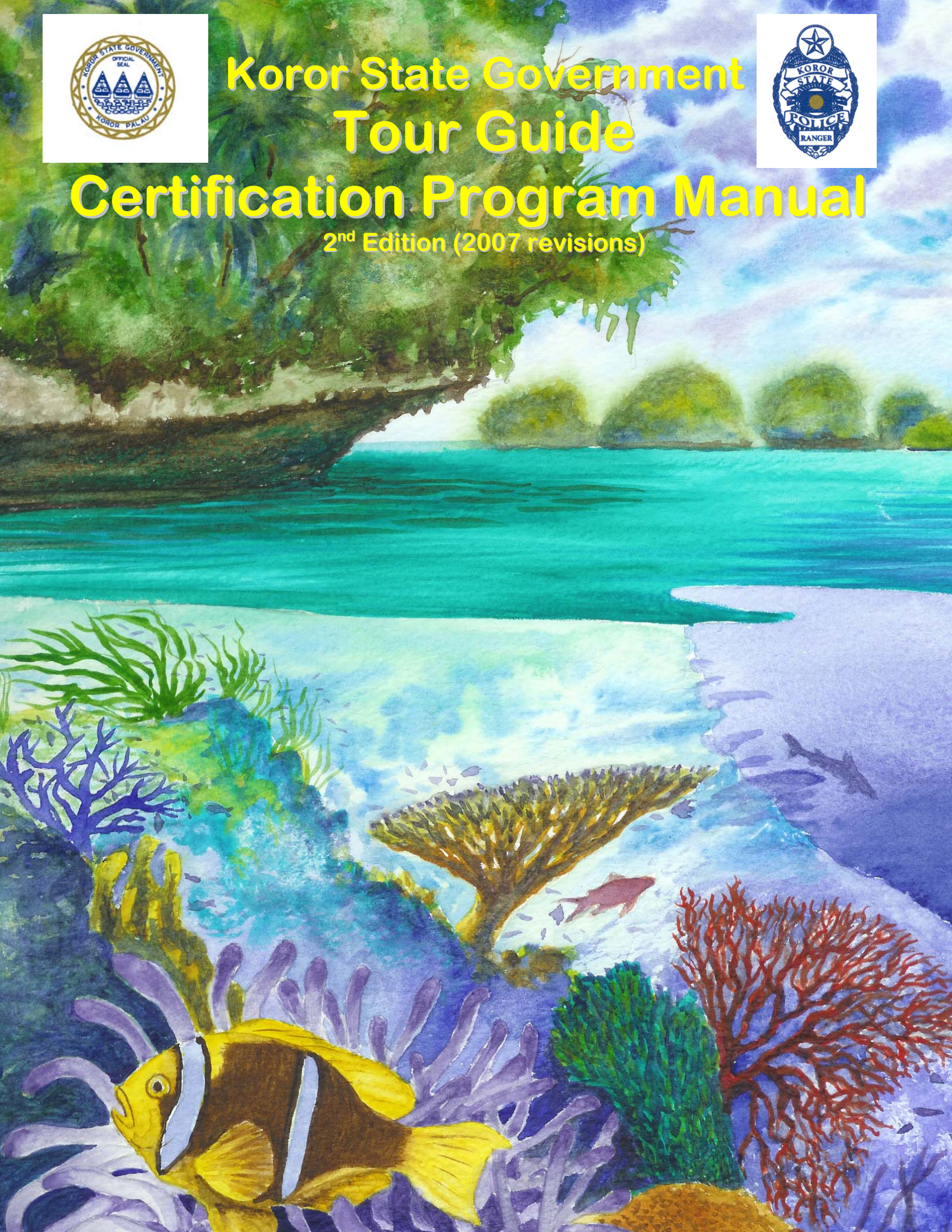
Koror State Government
Tour Guide
Certification Program Manual

2nd Edition (2007 revisions)



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Chapter 1: Palau Today



Koror State Government
Office of the Governor


Yositaka Adachi

December 13, 2005

A Message to all Tour Guides

Palau today is a direct product of its unique culture, history, and natural environment. As Palau looks to its future, the sustainable use of its resources becomes a key issue in securing that future. Tourism is regarded as one way to utilize those resources sustainably, while contributing to the growth of Palau's economy. In recent years, the worldwide expansion of the tourism industry has encouraged Palau to explore its potential and to invest more in the resources that sustain the industry as well as in the people and services who contribute to the industry's success. Marine-based activities, such as diving and snorkeling, have been and continue to be the predominant reasons for visitation to Palau. Initially tourists came exclusively to dive in the Rock Islands Southern Lagoon Area of Koror State, but in recent years activities have diversified to include Rock Island tours, snorkeling, fishing, and other watercraft activities.

As a tour guide, you play a significant role in the tourism industry, as it is you who interacts most directly with Palau's visitors. Your insight and information directly reflects the impression that visitors to Palau and Koror State, will take home with them and share with future visitors. It is your knowledge, attitude, skills, and services that have a profound affect on the current and future visitors of Palau.

This manual has been compiled by Community Centered Conservation (C3) on behalf of Koror State Government in an effort to provide information pertinent to the marine environment, culture and history of Palau, which may be of use to all tour guides operating in Koror State waters. It is a result of research into other country's tour guide programs, questionnaires and interviews with tour guides here in Koror and consultations with other stakeholders in the government, private and tourism sectors.

The final product will hopefully provide a source of reference materials for you on a wide range of topics, which tourists may ask questions about or you may be interested in from a personal perspective. Used in combination with a compulsory Marine Tour Guide Certification Course, it will serve to both streamline and augment the presentations and interpretations of Koror's unique cultural and natural resources to the visitor.

We hope that this manual will be made available in at least English, Japanese and Chinese to allow all guides to benefit from the information provided.

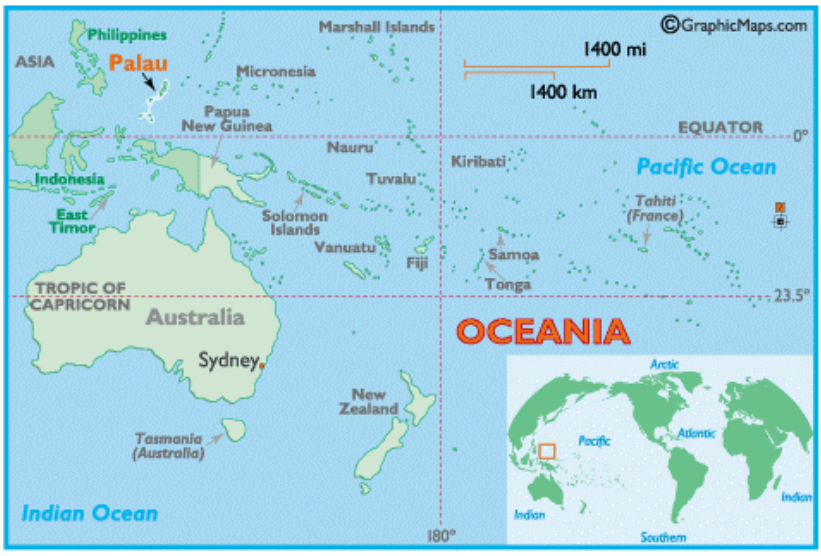
Together we can help visitors to make the most out of their time in Koror through information and awareness on how special Palau's natural and cultural heritage is and how we can all help to protect it for the future.

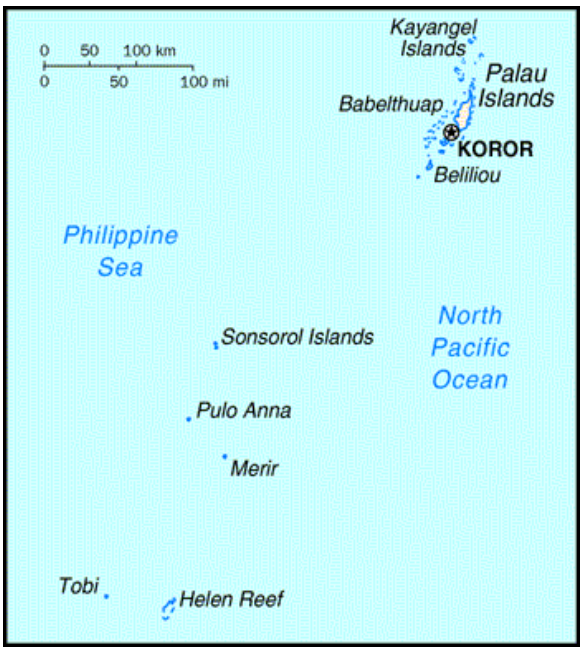
Yositaka Adachi
Governor of Koror State

1.1 Geography of Palau

1.1.1 Location and Population of Palau

Palau is part of a longer chain of islands within the group of islands known as Micronesia (meaning "tiny" islands). Palau sits approximately 500 statute miles (800 kilometers) north of New Guinea, southeast of the Philippines and southwest of Guam in the Mariana archipelago. Its closest neighbor within the group of Micronesian islands is Yap, which is a member of the Federated State of Micronesia. Palau has a total land area of 190.655 square miles (460 square kilometers, Source: PALARIS 2006) surrounded by a 70-mile-long (112 kilometers, source, PALAU - REA) barrier reef that forms a lagoon approximately 560 square miles in size.





http://www.cia.gov/publications/factbook/maps/ps-map.gif

Palau also owns an exclusive fishery zone of twelve nautical miles beyond its baseline. Palau is an archipelago stretching between 7 degrees and 20 minutes north latitude and 134 degrees and 28 minutes east longitude (between 2 and 8 degrees latitude from north to south and 131 to 134 longitude from east to west). There are 300 high and low islands (Palau archipelago consists of 586 islands, spread over an area of 1,940 sq.km, Source: Palau Nature Facts, TNC) with the low islands mostly situated near the extreme ends of the archipelago. The total area of all the islands of Palau is 188 square miles (source: Palau Nature Facts, TNC). At the northern end are the islands of Ngeruangel, Ngcheangel (Kayangel), and Babeldaob. At the southern end are Oreor (Koror), Ngerekebesang, Ngemelachel, Chelebacheb (Rock Islands), Ngerechong, Ngemelis Islands, Ngebed. Beliliou and Ngeaur are in the southern portion.

Farther south, at least 350 statue miles (about 575 to 600 kilometers from main islands of Palau, source: Palau Nature Facts, TNC,) from Koror, are the Southwest islands of

Sungesol (Sunsorol) and Fana, Bul (Pulo Anna) and Merir, Hatohobei (Tobi) and Helen Reef. The largest island, Babeldaob, is about 25 miles (40 kilometers) at its widest area and consists predominantly of rolling hills. The highest point is Mt. Ngerchelchuus at about 719 feet (219.15 meters), on the island of Babeldaob. Rivers and Lakes can be seen throughout the various states of Babeldaob including the longest river, the Ngermeskang River, about 9.8 miles long, along the west coast that flows into the Ngeremeduu Bay, the largest coastal estuary, watershed area, and conservation area in Micronesia. Along the east coast is the second longest river, the Ngerdorch River with the Ngerdorch Watershed that includes Lake Ngardok, the largest freshwater lake in Micronesia. (Natural History of Palau)

(2007 revision Sources: 2004 Palau Nature Facts, The Nature Conservancy (TNC), the Palau Rapid Ecological Assessment (REA) 1994 Summary, and Communication with the (PALARIS) Palau Automated Land And Resources Information Systems Office)

According to statistics from the 2000 census survey conducted by the Ministry of Finance, Office of Statistics, Palau's total population is 19,129 people.

Ethnicity	Number of Residents
Palauan	13,364
Non Palauan	5,765
Total	19,129

1.1.2 Climate


Photo: Patricia Davis

Palau has a maritime tropical climate with a high amount of rainfall. The average daily temperature throughout the year is 81 degrees Fahrenheit while the relative humidity is about 82%. An average of rain feeds into the rivers and streams of Palau, contributing to the humidity levels. Wind direction shifts occur with the trade winds blowing from the northeast and east during November to May. From June to September, winds come from the southwest. These wind directions, rainfall, and temperatures contribute toward the conditions of survival for the flora (plants) and fauna (animals) of Palau. In addition, the changing physical characteristics of the islands have been affected throughout millions of years by the natural forces wind, rain, and movement of the Earth's crust.

Presently, man and technology have played major role in changing Palau's physical characteristics including its rich and diverse marine resources.

1.1.3 Geology and Formation

The volcanic islands of the Pacific were formed as floating plates (moveable sections of the earth's crust) on top of the mantle (part of earth between the center and the plates) deep within the earth pushed against each other. Palau is part of a mountain range that formed as a result of the Philippine plate pushing down on the Pacific plate approximately 40 to 70 million years ago. The movement resulted in volcanic activity that created large islands in the Pacific. The main islands of Palau are volcanic in origin and include the islands of Koror, Malakal, Arkabesang, and Babeldaob. Originally these islands were much higher, but over time have been worn down by wind and rain to their present stature. The reefs that bordered these islands continued to grow and expand close to the surface of the ocean where there was abundant sunlight. This reef growth resulted in the formation of atolls and low coral islands where ancient volcanoes sunk or subsided. The formation of raised limestone islands occurred where the underlying plate uplifted. These limestone islands are composed of ancient reef structures formed by corals, calcareous algae, and many marine invertebrates. The jagged harsh surface of the limestone is caused by years of erosion from rain and wind. The mushroom shape of the Rock Islands is the result of its famous natural undercut. This undercut was formed by three processes of erosion: biological, chemical and physical. Bioerosion is caused by countless grazing and boring by invertebrates like chitons, sea urchins and worms. Chemical dissolution is caused by carbonic acid that is formed from water and carbon dioxide from the plants on the islands. Physical erosion is caused by the constant tidal fluctuations and wave action.

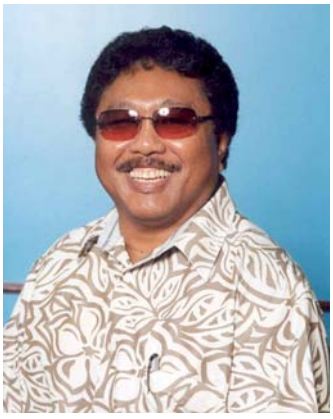
Information Source: History of Palau. 1997. Heritage of an Emerging Nation. Elizabeth D. Rechebei and Samuel F. McPhetres. Ministry of Education. Republic of Palau.
Ann Kitalong, 2002. A Personal Tour of Palau.

1.2 Modern Palau

1.2.1 Government Structure in Palau

The Palauan Government has three interdependent authorities – national, state, and traditional. The constitution effective in 1981 is the supreme law of the land.

The national government has an executive branch, led by the President, a two-house legislature, and a judiciary. The country is divided into 16 states, most of which were municipalities under the Trust Territory Government. Each state has its own executive and legislative branches. The state governments are subsidiaries of the national government and derive their power from the national government. The Palau constitution provides that the states have only those powers specifically given by the national government or denied to the national government.



High Chief Ibedul Gibbons

Palau's traditional system still exists and operates both within and outside the constitutional government. Participation by titled leaders in the national government is limited. The government has a Council of Chiefs that has the authority to advise the President on customary matters.

There is no participation of traditional leaders in the national legislature (OEK).

In contrast to the national government, the state governments are constitutionally mandated to follow both "democratic principles" and "traditions of Palau," and chiefly power is consequently much greater at the state level. Nearly all the state governments integrate titled leaders into their executive and/or legislative branches.

The amount of real authority granted to such leaders, however, varies widely among the states. In the executive branches, for example, three states give complete decision-making power to their chiefs or high chief. At the other extreme, six states include no participation of traditional leaders in their executive branches. The remaining seven states have opted for an intermediate participation level by their chiefs, giving them limited decision making power or merely advisory functions. This range of power is similar in the states' legislative branches. The legislature of two states contains only titled leaders. Seven have a mix of elected and titled members. One has two houses – one elected and one titled. The remaining six states have legislatures that are entirely elected.

1.2.2 Governance in Koror

Koror State is the center for economy and commercial infrastructure for the nation and is the host of about ninety percent of Palau's tourism related activities that is concentrated around the Rock Islands – Southern Lagoon Area. It is important to understand the governance that constructs the laws and government of Koror.
The primary responsibility for the administration of Koror State is vested in the Governor, who is voted in office every four years. The Governor's duties include enforcing the laws of Koror State. The legislative branch of government consists of representatives elected by each of Koror's twelve hamlets and five members elected at large. The legislature enacts laws and has the power to levy and collect taxes. The House of Traditional Leaders (HOTL), consisting of Ngarameketii (absolute chiefs representing the four main hamlets of Koror) and Rubekul kledeu (chiefs representing the other seven hamlets of Koror) is the supreme authority of Koror State for all matters relating to traditional law. The HOTL advises the Governor on matters relating to traditional law and may propose bills to the Legislature.

The Koror State seal features three bai, representing the House of Traditional Leaders, the Governor and the Legislature. The Rock Islands Southern Lagoon Area is a successful example of a state resource that has been governed and actively managed under both traditional and constitutional law.

The Rock Islands – Southern Lagoon Area is owned by Koror State and regulated by 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 Koror State Department of Conservation and Law Enforcement is responsible for day-to-day management and coordination of activities within the Rock Islands Southern Lagoon Management Area (referred as Management Area) as well as enforcing all State laws. (please see Environmental Regulations for details).

The Traditional Leaders had 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. The Koror State Department of Conservation and Law Enforcement developed the management plan with assistance from The Nature Conservancy and Palau Conservation Society.

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 a comprehensive Management Plan for the Rock Islands Southern Lagoon Area and will lead its implementation. The Tour Guide Certification Training Program is the responsibility of this department and is part of the department's education and capacity building program, supplementing the Rock Islands Southern Lagoon Area Management Plan.

1.2.3 Land and Sea Tenure

Traditionally, Palauan land was divided into political units called *beluu*, or villages. Boundaries were in flux, determined by warfare and other factors, and generally extended as far out to the sea as one could travel by canoe and still see the islands. The territory of each *beluu* was divided into clan lands, *chetemel a blai*, and public domain land, *chutem buai*. Public domain land, which comprised the bulk of the land in Palau, was land not claimed by any clan, lineage, or individual. This land was managed by the village council. Land owned by clans and lineages comprised less then half of Palau's land. Alienation of clan land could be done via trade, sale, mortgage, service reward, marriage exchange, or punitive fine, and with the exception of the last option, could not be alienated without the approval of the strong members of the clan.

Palau was governed by a series of occupying powers during most of this century, and these governments took large portions of Palauan land under their control. Land not being used at the time, regardless of ownership, was taken as public land. What was not declared public was registered as private in the official land registry under the names of individuals. This was done regardless of whether the land had belonged to an individual or to his or her clan or lineage.
Today land in Palau is owned either privately – by individuals, clans, or lineages, or publicly – by the national or state governments. With Palau's recent independence, there has been a move to return wrongfully taken land to its original owners.

The Palauan Land Court, created in the Land Claims Reorganization Act of 1996, is responsible for determining ownership of all land within the Republic. The goal is that by the end of the century, all land once owned by individuals, clans, or lineages will have been returned to those persons or groups and the remaining land will be public domain. Public land is managed by the Palau Public Land Authority and eventually will be transferred to each of the state public land authorities.

The Palau constitution grants the states "ownership" of all living and non-living resources from the land to 12 miles (1.85 kilometers) seaward from the "traditional baselines," provided that traditional fishing rights and practices are not affected. The national government retains control over the resources that Palau claims beyond 12 nautical miles.

1.2.4 Traditional authority and the management of natural resources

In the past, Palau's traditional leaders were the caretakers of the resources of the land and sea. Palauans established a society closely tied to reciprocity and respect for both members in the community and the natural environment. The Palauan word 'omengull' literally translates into 'respect', and this respect plays a vital role in how the consciousness of Palauan culture proliferates in these modern times.

Today, much of that responsibility has been taken over by the national and state governments. But as described above, the constitution grants chiefs considerable authority to continue in their traditional roles. They may exert their authority both through purely customary processes and through the state governments.

In fact, both the states and the chiefs appear to be taking more control over how Palau's natural resources are used. There have been more and more examples of chiefs declaring *bul* (taboo or closure) over certain areas or resources.

The state governments, with their mixed titles and elected leadership, are also becoming increasingly active with regard to the management of community resources. Several states have established permit systems for fishing and tourism. These systems control access to community resources and ensure that the community receives at least some of the benefits from those activities.

(Information Source: Palau Conservation Society Government Fact Sheet)

1.2.5 The Economy of Palau

Palau's economy consists primarily of tourism, fishing, and agriculture. The government is the majority employer of the work force, with consistent long-term financial aid from the USA and Japan. More recently other Asian, Pacific, and European Nations have aided Palau financially. Business and tourist arrivals numbered 50,000 in FY00/01. The population enjoys a per capita income twice that of the Philippines and much of Micronesia. Long-run prospects for the key tourist sector have been greatly bolstered by the expansion of air travel in the Pacific, the rising prosperity of leading East Asian countries, and the willingness of foreigners to finance infrastructure development.

Tourism Industry

One of the unique and irreplaceable attractions of Palau is its marine environment. The unequaled beauty of the Rock Islands has become the worldwide symbol of Palau. In 1989 Palau's reefs and waters were declared one of the seven wonders of the underwater world by CEDAM (Conservation, Education, Diving, Awareness, and Marine Research) International. The result of this exposure has been a unique blend of international tourism. Tourism has been a major economic boost for Palau, says Mary Ann Delemel of Palau Visitors Authority. The industry has generated other economic activities such as arts and crafts production, agriculture, retail shops, and marine related

sports activities. Tourism has also increased the amount of employment opportunities within a broad range of skills. Land based activities focusing on cultural sites, mainly in Babeldaob, have recently begun to rise as well. Foreign visitors are now interested in the marine and terrestrial resources that Palau has to offer within its unique island environment.



PVA

Information Source: History of Palau. 1997. Heritage of an Emerging Nation. Elizabeth D. Rechebei and Samuel F. McPhetres. Ministry of Education. Republic of Palau.

1.3. Tourism Network and Activities

1.3.1 Palau Visitors Authority

The mission of the Palau Visitors Authority is to promote and encourage the development and marketing of tourism as one of the main revenue earning sectors of the Republic along with fishery and agriculture.

To achieve this PVA undertakes the role of the country's tourism authority whose position is to be visionary and present a strong image of Palau as a special destination appealing to the high end and environmentally conscientious clientele. To this end it invests 60% of its annual budget on marketing and promotion activities. At the local level, PVA is responsible for generating awareness and an understanding of tourism within the community to ensure that the Palauan people understands what tourism is about, what it does, and how it affects our island nation.

The PVA is composed of seven members of the Board of Directors who are appointed by the President, with advice and consent of the Senate, to serve a term of two years. Its primary duties are to develop policies, guidelines, and work plan activities that are implemented through the managing director who oversees the day to day activities of the organization.

The Board has another key responsibility in that it recommends to the President and the Congress passages of legislation pertaining to tourism. The PVA acts as a liaison between the tourism industry and the community, particularly the states, by accessing and encouraging development of potential tourist sites and land-based activities for the purpose of spreading tourist traffic throughout Palau and diversifying tourism attractions.

The PVA is organized into four departments: 1) Marketing and Research, 2) Support Services which combines operational functions and community services of the authority, 3) Finance, and 4) Human Resources.

The customers of the PVA are visitors to the Republic, internal staff, tourism industry operators, state and national government and the public.

PVA's Goals and Objectives

The PVA Board has adopted the following key operational objectives:

- To continue to strengthen Palau's presence in the traditional markets of Japan, North America, and Taiwan
- To intensify public awareness campaigns in the newly developed markets in Europe, Asia (Philippines, Taiwan and Hong Kong.), and in particular, in response to the SARS negative publicity
- To look into new markets, particularly in areas like Australia, Thailand, and Korea
- To play a proactive role in the development of diversified tourism activities and develop a marketing strategy that supports it
- To work closely with the industry, both public and private to achieve improvement in the quality of services and products offered to visitors as well as the quality of visitors to the Republic
- To continuously develop staff professionalism for the purpose of providing excellent customer services within and outside of PVA
- To establish and maintain clear corporate governance including personnel and financial policies
- To improve recording and accountability of budgetary and financial transactions, to ensure full compliance with laws and regulations and generally accepted accounting standards
- To maintain budgetary and internal controls for the purpose of getting more for the limited budget

Priority Areas

In concert with the responsibilities tasked to the PVA in the Management Action Plan (MAP), the PVA Board of Directors has adopted the following as priorities for PVA to achieve in the immediate and medium terms; (some are long term strategies).

1. Establishment of the national tourism policy for the Republic: in view of the progressive infrastructure development that is expanding rapidly in Palau, it is critical that a sound policy on tourism is established to address appropriate guidelines and standards with which to sustain the long term viability of tourism in the Republic. The first step in the process, which is to identify issues of priorities and lay out the action plan for each issue, is completed. Awaiting official

approval of the OEK is the creation of the National Tourism Unit or similar body that will spearhead the implementation process.

2. Maintain diving as Palau's foremost attraction while developing the marketing image of Palau as a special destination in the world with unique natural and cultural attractions other than diving. There is considerable potential for Palau to diversify its attractions and therefore expand its image from just being a dive destination to nature, adventure, culture, and eco- tourism.

3. With the terrorist attacks in 2001 (NYC) and 2002 (Bali bombings) and most recently with the outbreak of the SARS virus, Palau is likely to experience substantial decrease in visitor arrivals. An aggressive marketing strategy needs to be in place to respond to these external factors and solidify Palau's position as a safe and pristine tourist destination in the immediate term. In particular, an aggressive promotions plan is to be in place for Japan, one of Palau's most important markets. Timing is opportune for an active campaign to attract visitors from Japan to Palau where visitors from SARS infected countries temporarily stopped.

4. Work with the industry, state, and national governments to establish a hotel/motel rating system and dive management plan to ensure the long term sustainability of the industry.

5. Administration: While not specifically identified in the MAP, internal controls and exercise of prudent management of resources will be improved and consistently followed to ensure accountability as well as "getting the most out of each dollar spent". Improvement to financial reporting and accounting procedures consistent with acceptable accounting standards will be ensured.

6. The Human Resource department will conduct a comprehensive analysis of employee job descriptions to ensure that functions do not overlap and if so, revisions will be made to make full utilization of manpower capability within the organization. The human resource department will look into capacity building, reliable evaluation, and merit systems.

7. Awareness as to the importance of tourism in the Republic: continuous dialogue between and among state and national government entities, operators and private sector as stakeholders of this important industry will continue to improve.

Information Source: Palau Visitors Authority

1.3.2 Visitors to Palau

Visitors are the key to tourism, keeping the entire tourism network working. Their attitudes, actions, and experiences play a critical role in sustainability for Palau in terms of both economy and ecological health of the natural resources on which tourism depends.

It is important to have a general knowledge of the tourists who visit Palau, and the activities that they participate in during their stay in Palau. Palau Visitor's Authority is the primary source of information on this subject:

Palau has seen an 8% increase in the total number of visitors from 2001 to 2002.
The following table gives the breakdown of visitor percentages according to ethnic background. About half of Palau's tourists visit with the primary purpose of scuba diving.

Country	Number of tourists per year (2003)	Percentage by country of origin	Percentage divers among tourists
USA	3,495	6%	77%
Japan	20,952	35%	91%
Europe	1,123	2%	89%
Taiwan	27,710	46%	22%
Others	6,571	11%	57%
Total	59,851	100%	55%

Most of the remainder is "general interest" tourists, but virtually all of them engage in marine recreational activities, including snorkeling, motorboat touring, kayaking, and fishing (PCS, 2001). A recent survey conducted by Community Centered Conservation (C3) identified seven major marine-based activities, which are offered and utilized within the tourism industry. These include scuba diving, snorkeling, kayaking, boating or jet ski rental, sea walk, parasailing, and banana boating. All of these activities take place within the southern part of Palau's main archipelago known as the "Rock Islands Southern Lagoon Area" (2003).

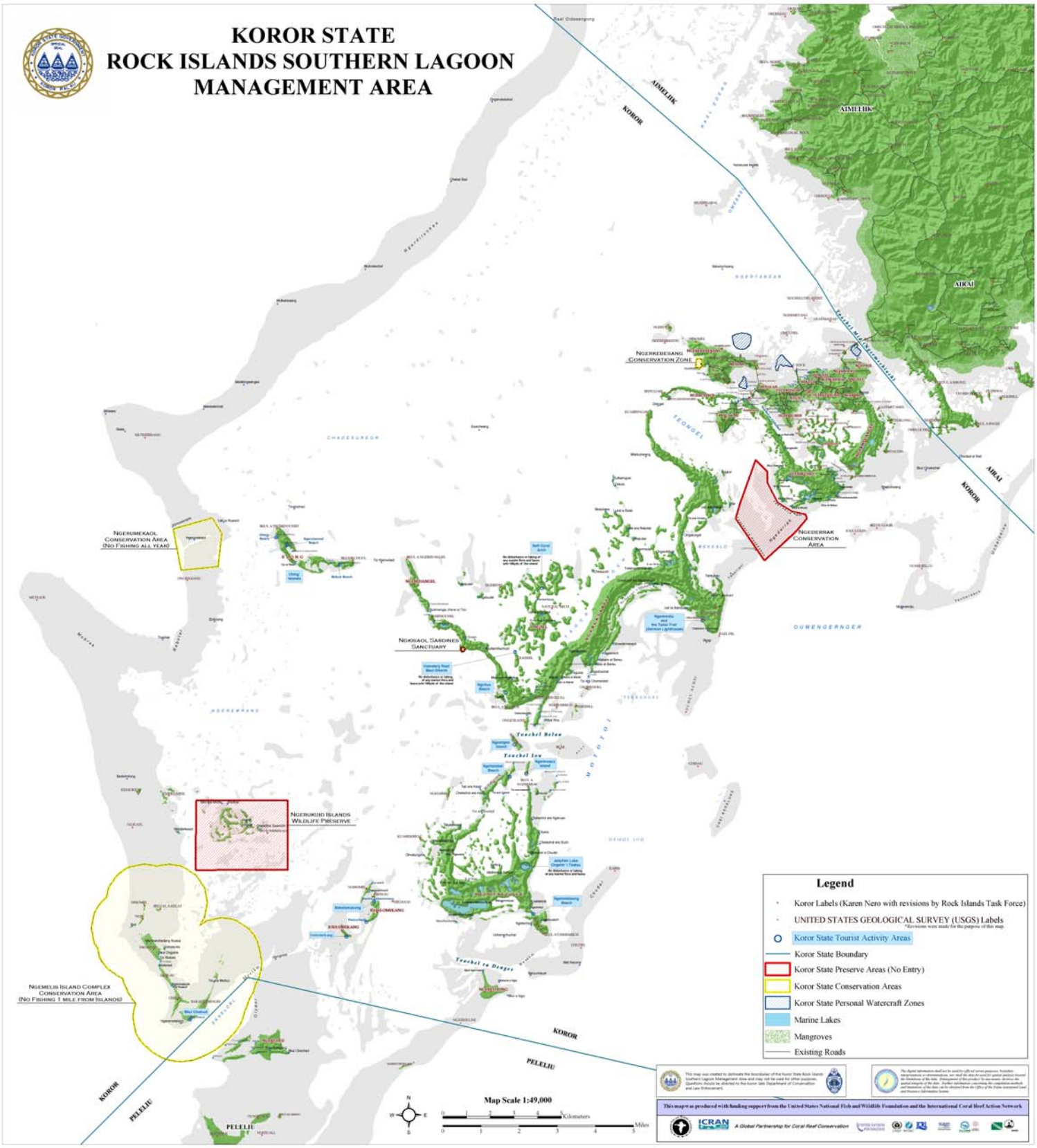
1.3.3 Marine Tourism Activities and Sites

Scuba Diving
Scuba diving is one of Palau's main tourism activities. Palau provides excellent opportunities for all levels of diving, from novice through advanced. There are currently 75 dive sites in Palau and 75 percent of those are located within the Rock Islands Southern Lagoon Area (PCS, 2001). There are 22 identified tour operators in Koror who offer scuba diving tours (C3, 2003).

Snorkeling
Snorkeling is also a popular tourist activity in Palau, particularly since is requires much less training and equipment. There are 25 identified tour operators in Koror who offer snorkeling tours (C3, 2003).



Other Marine Activities
Kayaking, fishing, boating, watercraft/ski rental, sea walking, parasailing, banana boating, and other activities are also available.


KOROR STATE
ROCK ISLANDS SOUTHERN LAGOON
MANAGEMENT AREA
AIMELIIK
KOROR
AIRAI
PELELIU
NGERUMEKAOL CONSERVATION AREA (NO FISHING ALL YEAR)
NGERKEBESANG CONSERVATION ZONE
NGEDERRAK CONSERVATION AREA
NGEMELIS ISLAND COMPLEX CONSERVATION AREA (NO FISHING 1 MILE FROM ISLANDS)
NGERUKUID ISLANDS WILDLIFE PRESERVE
NGOKSAOL SARDINES SANCTUARY
Legend
Koror Labels (Karen Nero with revisions by Rock Islands Task Force)
UNITED STATES GEOLOGICAL SURVEY (USGS) Labels
*Revisions were made for the purpose of this map.
Koror State Tourist Activity Areas
Koror State Boundary
Koror State Preserve Areas (No Entry)
Koror State Conservation Areas
Koror State Personal Watercraft Zones
Marine Lakes
Mangroves
Existing Roads
Map Scale 1:49,000
Kilometers
Miles
This map was produced with funding support from the United States National Fish and Wildlife Foundation and the International Coral Reef Action Network
ICRAN
A Global Partnership for Coral Reef Conservation

Chapter 2: The Tour Guide



2.1 Tour Guide Roles & Responsibilities

2.1.1 The importance of the tour guide

Tour guides are important to Palau and Koror State in many ways. They are an irreplaceable part of the tourism industry, because they interact directly with tourists who generate a large part of Palau's economy and play a direct role in determining how interesting, educational, safe and fun the tourist's experience in Palau will be. While you are guiding in Palau remember to show respect to other guides working along side you, regardless of race or gender. Show respect to the weather and the ocean, but most of all respect our unique natural environment for future generations.

Tour guides have an impact on the behavior of tourists in Palau because of the intimate role they play. Tourists take their cues on acceptable behavior from their guides. If a tour guide behaves poorly, such as taking organisms from the reef or damaging the reef through improper dive etiquette, the tourist will likewise behave poorly and leave behind scars that mark their vacation in Palau. Tour guides that promote good dive etiquette and properly brief their clients before each dive will help preserve the beautiful marine life that tourists come to see. Tour guides are critically important to the conservation of the Rock Islands and Southern Lagoon Area. Apart from helping moderate the destructive behaviors of tourists, guides are present more than almost anyone else in the conservation areas. Guides can report on illegal activities in the area and monitor the status of the marine resources that they see nearly every day. By participating in the preservation of those resources, the tour guides help ensure that Palau retains the healthy marine environment which draws tourists here year after year.

2.1.2 Roles of the tour guide

The tour guide has a few major roles to fulfill while he or she is getting paid to showcase the natural attractions the tourists are here to see. The Guide has to provide an interesting, educational, safe and fun experience for the tourists. On top of that, the tour guide needs to ensure that the tour doesn't cause damage to the environment the tourist are here to see. In order to do this, the tour guide is responsible to do the following:

- Research and collect data and information about Palau's natural, cultural and human resources, history, popular destinations, anticipate questions and be prepared to accurately answer any questions asked by guests.

- Know local, common, and scientific names of common marine and terrestrial organisms.

- Be familiar with Koror State regulations, and be able to brief tourist on restrictions.

- Be able to give appropriate instructions on the use of the reef hook.

- Demonstrate appropriate dive etiquette and be able to explain what not to do while diving or snorkeling in Palau.

2.1.3 Roles of the tour guide

Apart from playing a huge role in ensuring a pleasurable experience for tourists in Palau, the tour guide also has a responsibility to make sure the experience is safe as well. If something goes wrong in the course of a tour, it is usually the guide who will be held responsible. In order for this not to happen, the guide needs to do the following:

- Prepare all gear and equipment for the tour, and make sure it's functioning properly.
- Ensure there is a properly functioning boat and safe boat operator for the tour.
- Check weather conditions, tides and water craft warnings before the tour, and be prepared for alternate plans.
- Give proper and thorough dive briefings to tourists, including safety tips, what not to do, and what to do in case of separation from the group.
- Be certified in First Aid and CPR.

2.2 Diving Briefings

The dive briefing is an integral part of safe and enjoyable dives. The tour guide should be sure to do a proper dive briefing before every dive to ensure that the tourists know what to expect and how to behave while on the dives. A good diver briefing includes:

1. Dive Site Name – partly for fun but also for the divers information, often the diver will insert it into their log – if the name is unusual it is useful to tell them the story behind the name
2. Site Description – this includes a description of the site layout, points of interest, depth, bottom composition, currents or water movement, temperature, hazards, and other information
3. Your Role – tell the diver where you will be and what you will be doing
4. Entry and Exit Points – divers appreciate recommendations, descriptions, and reminders of techniques – it makes the dive easier and more relaxed
5. Dive Procedures – this includes course to follow or direction to head, ways to avoid common problems, reminders to make safety stops, air reserve methods, maximum depths, and maximum bottom times
6. Emergency Procedures – includes problems that may occur unique to the dive site and how to handle these situations, low on or out of air procedures, and diver recall practices
7. Signal Review – remind buddy teams to review their signals between them as well as inform them on the signals you will use regarding both the technical aspects and the observations they should make
8. Roster/Buddy Check – be sure to establish and review buddy teams
9. Environmental Interaction Suggestions
    - Identify organisms to respect and be cautious of
    - Remind them not to damage environment by controlling buoyancy, not kicking or grasping the reef
    - Discourage fish feeding
    - Take only pictures; leave only bubbles!
10. Pre-dive Safety Check – remind divers and be the extra set of eyes; check air level, weight, proper set-up of gear, etc.

Information Source: PADI Dive Master Manual

2.3 Responsible Diving Etiquette

The tour guide should be an excellent example of responsible diving etiquette, and should be prepared to explain good diving etiquette. The responsible and caring tour guide does the following:

- Does not touch, handle, or provoke any marine organism.
- Does not stand, rest fins, or hold onto corals. If you must touch the reef to steady yourself in currents, use a reef hook or only your fingertips on dead part of the reef or coral covered in algae.
- Does not alter or deface anything on the reef.
- Does not collect or remove any corals, sea grass, algae, or any other marine organisms.
- Secures equipment such as gauges and alternate air sources so that they do not drag over the reef.
- Avoids kicking up sand because stirred up sediment can settle on coral and smother it.
- Does not harass marine life, a good guide observes marine inhabitants from a distance.
- Does not dispose of his/her or tourists' garbage in the ocean.
- Does not throw anchors indiscriminately, because it causes irreparable damage to the reefs.
- Uses recyclable containers whenever possible to reduce waste.
- Does not spearfish with scuba gear.

Information Source: 1994. The Environment, Inc. Tour Guide Handbook

2.4 CORAL-FRIENDLY SNORKELING GUIDELINES

Coral reefs are one of the world's most spectacular marine habitats and snorkeling is an excellent way of exploring them. As coral reefs face an increasingly uncertain future, snorkelers and other coral reef visitors can play an important role in helping to protect these fragile habitats by following a few simple guidelines.

Before Setting Out To Explore the Reefs:

- Make sure tourists have the best possible instruction you can give.
- Be sure to practice snorkeling skills in a swimming pool or sandy area until you are completely comfortable in the water.
- Make sure your equipment fits properly before you snorkel near corals, because it can be very difficult to adjust in the water.
- If tourists are feeling unsure, have them wear a snorkel vest – many operations insist on them.
- Learn all you can about coral reefs – they are fascinating and fragile environments.

2.4.1 Snorkel in the Comfort Zone

To get the most out of snorkeling, “stay within your comfort zone.” You will see much more and be able to enjoy the beauty of the reef more by hanging back. Depending on snorkeling skills, experience, fitness and age, each snorkeler will have their own personal safe distance from the reef from which to comfortably enjoy it without causing harm.

2.4.2 Snorkeling out on the Reef

Be sure to avoid all contact with corals and other marine life. Not only could you be hurt but corals are fragile animals – as much as a gentle touch can harm them. Even sand kicked up by fins can smother and kill them.

- Be careful where you get into and out of the water to avoid walking on corals.
- Be sure tourists snorkel in their “comfort zone” – don’t get too close to the reef.
- Make sure tourists lie flat in the water, and avoid coming upright so they don’t stand on corals.
- Tell tourists to avoid swimming with their arms to avoid accidental touching of the reef.
- Tell tourists to make sure they know where their fins are so they don’t kick anything.
- Tell tourists to move slowly and deliberately in the water, relax, and take their time
- Remind tourists to look but not touch.

Snorkeling pros know the real way to enjoy the beauty of the reef is to slow down, relax and watch as reef creatures go about their daily lives undisturbed.

2.4.3 Going on a Snorkeling Holiday

- Opt for conservation conscious accommodation and facilities, such as those saying they recycle and treat sewage and solid waste in an environmentally friendly way.
- Look out for and support coral parks and other marine conservation areas.

2.4.4 As a Responsible Snorkeler

- Do not touch anything in the water.
- Never chase, harass or try to ride marine life.
- Take nothing living or dead out of the water except recent garbage.
- Do not touch, handle or feed marine life except under expert guidance and following established guidelines.
- Do not use gloves in coral environments – it will make you much more careful about what you touch.

2.4.5 On Boats

- Choose operations who make use of moorings when available – anchors destroy fragile corals when set directly on the reef.
- Make sure garbage is well stowed, especially light plastic items such as cups and bags that can easily be blown overboard.

- Be sure to take away everything that was brought on board and dispose of garbage safely and responsibly.

2.4.6 Shore Side

- Support coral parks and other conservation projects
    - Pay user fees in recognized coral parks and reserves which are actively supporting coral reef conservation.
    - Encourage and support the use of boat moorings.
    - Participate in local initiatives to monitor the marine environment (e.g. sighting forms.)
    - Participate in cleanups.
    - Volunteer your skills to help coral parks with reef surveys, outreach and awareness.
    - Consider donating used equipment such as cameras, dive gear or Reef ID books.
- Take your garbage home with you especially items such as batteries which are toxic and difficult to dispose of safely in countries without special waste handling systems.
- Refuse to buy souvenirs made from coral, turtle and other marine life – often this is illegal as many endangered species are protected under CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) and by national laws.
- Speak up: make sure snorkeling buddies understand about these simple conservation practices – we need to work together to protect and conserve coral reefs for all time.

Being a coral friendly snorkeler not only helps to protect coral reefs directly, it also helps to raise awareness for coral reef. Be sure to find out local laws and regulations as they may differ from these general guidelines.

Information Source: These guidelines were developed by the Coral Parks Program of the Coral Reef Alliance and co-endorsed by the Project AWARE Foundation. © CORAL. Suggestions for improving these guidelines should be sent to info@coral.org.

2.5 BEST PRACTICE GUIDELINES FOR NATURAL SITES

Even if you are aware of the following guidelines, please read them and make sure your visitors follow them in order to minimize their impacts on our natural treasures, so that they will be kept in good condition for future generations of Palauans and tourists to admire and enjoy**.** When taking tours to natural sites, guides need to do the following:

- ✓ Always store your trash in plastic bags and take it back with you to Koror on the boat. It looks ugly left on the beaches and can pollute the sea and suffocate marine life.
- ✓ Never stand on, kick or hold coral or other sessile (stationary) marine life. Coral is a living organism and can be damaged easily. Explain this to tourists; and

when diving, make sure their buoyancy is adjusted so that they minimize their risk of touching the reef during your dive.

- ✓ Photographers are often seen to cause damage on the reefs as they lean against and/or hold onto living animals in order to get the perfect shot. Discourage photographers from holding onto corals, (especially lying on it!) before they enter the water and ask them to only hold onto rock.
- ✓ Never allow fish feeding from your boat or the beach. It changes fish behavior and upsets the nutrient balance in the water, especially at sheltered beaches, where it can promote algal? growth. Let's keep our beaches white, not green!
- ✓ Do not allow divers to wear gloves – this will prevent them from holding onto living animals such as corals, sponges and sea fans.
- ✓ Use less packaging, e.g. take lunches out in reusable Tupperware boxes rather than Styrofoam boxes. Palau already has a problem with landfill issues, so create less waste wherever possible.
- ✓ Use four-stroke engines if possible. They use less fuel and do not leak oil into the water.
- ✓ In Jellyfish Lake, keep tourists away from the edges of the lake where they may disturb animals by stirring up sediments. Ask them not to remove jellyfish from the water as they break easily. Also keep your group as quiet as possible. Encourage them to enjoy the tranquility of the lake and listen to the birds that live in the surrounding jungle. Other tourists' experiences can be ruined by loud screaming and shouting in such a peaceful environment.
- ✓ If there are already several boats moored at a beach, move to another beach so tourists don't feel crowded together.
- ✓ Cigarette butts are an ugly site on many Rock Islands and pollute our environment. If your guests want to smoke, carry a disposal box for cigarette butts on your boat and ask them to use it. Never allow them to throw this trash in the ocean or on the beach. (Empty camera film canisters are good to give guests who smoke)

2.6 Communication and Public Speaking

Not all guides are experienced public speakers. It takes practice and time to Become a good guide. Here are a few tips from the Dale Carnegie course that may help you become a better speaker:

Every speaker must consider four points:

1. *Subject*
   3 types of subjects:
   1. Inform – how to get somewhere.
   2. Persuade – safety precautions are critical.
   3. Entertain – make your visitors smile.
2. *Audience*
   Know what your audience wants.
   Know what your audience already knows.
   Know attitudes and opinions.
3. *Him/Herself*
   Personality is the most important single factor in influencing an audience
4. *Occasion*

Think carefully about the time and place of your speech and the appropriateness of the subject.

Communication – sharing information; exchanging of information or message between two or more people which involves attitudes, emotions, and intentions

4 types of communication:

1. Gestures
2. Signals
3. Symbols and Pictures
4. Language and Writing

Problems with Communication

1. Delivering the message
2. Ensuring message gets attention
3. Ensuring message is interpreted
4. Ensuring message is accepted and acted upon

How to improve communication:

1. Smile and follow a plan
2. Be familiar with the group
3. Don't assume anything – provide all necessary information
4. Know your limits as a guide and refer questions to the right people

2.6.1. Tour Guide Skills and Techniques

Basics:

Outline Preparation

1. Tour Objective – what information should the group know after the tour is over
2. Content – what concepts, stories, ideas, and facts can be included that explains, emphasizes, or provides an example for what you want the group to know
3. Summary – review of the information given to the group

Tour Outline

1. Warm-up
    a. Welcome
    b. Personal Introduction
    c. Smile and Eye Contact with Group
    d. Brief Personal Information
    e. Ask introductory questions from the group
    f. Directions
2. Content
   Conduct the tour – give the group the information by asking questions and provide summaries of the information you wish them to know – do not overwhelm them with to many facts
3. Summary – Review, Thank You, and Smile

Other:

- When leading a group you must willingly accept the responsibility as a leader. Much of the anxiety among tour guides is due to self doubt and insecurity about what the visitors will think of them. Rehearsal is the best method in overcoming these fears.
- Good guides should always ask themselves the following questions:
    1. What are the characteristics of the listeners?
    2. Am I gauging the audiences' knowledge?
    3. Can they understand me?
    4. Should I utilize different vocabulary?
    5. Can my audience hear me?
    6. Am I speaking clearly and slowly?

2.7 Developing Your Own Tour Style

Personal style can be improved consciously through rehearsal of various types of communication, both verbal and visual. Style can be improved by watching performers in action on TV or by watching the style of other successful tour guides. Guides, like good teachers, interact with the audience. They are actors. Their performance is intended to inspire, enthuse, and inform the audience about the subject. Stimulating visitor enthusiasm and interest is the goal of the presentation.

2.8 Customer Management and Service

Remembering Names - can be easy if you consciously think about it as a process or procedure to do each time!
3 Methods:

1. Impression
    a. The Name - listen, ask for spelling, and write it
    b. The Person – face, size, and voice
    c. Want to remember
4. Repetition
    a. Use name immediately
    b. Use it often
    c. Repeat it silently
    d. Review it silently
    e. Talk about the name
    f. Use it when leaving
    g. Refresh you memory
5. Association
    a. Business
    b. Rhyme
    c. Appearance
    d. Meaning
    e. Mind Picture
    f. Similar Name

Enthusiasm – to really want to do something!

6 steps to follow:

1. Learn everything you can about your job and its relation to the company
2. Have a goal and stick to it
3. Give yourself a pep talk everyday
4. Train yourself to think in terms of service
5. Associate with enthusiastic people
6. Force yourself and you will become enthusiastic

7 Principles to Great Customer Service

1. Smile – it is universal, requires simple effort, and communicates friendliness and messages of love
2. Speed -quick service
3. Say Hello
4. Satisfaction – ensuring memorable and happy experiences
5. Safety/Security
6. Sincerity of Service – serve from the heart and love what your are doing
7. Spirit – be enthusiastic and love what you do

Information Source: The Environment, Inc. 1994 Tour Guide Handbook



2.9 Interesting Natural History Facts For Guides In Palau

Listed below are some facts your visitors may be interested in hearing about during their trip to Palau. See how many you can remember and use in your briefing:

- ✓ Palau has all the major island types found in the Pacific
  - ➢ High volcanic islands (Babeldaob, Koror)
  - ➢ Raised limestone islands (Rock Islands, Angaur, Peleliu)
  - ➢ Atolls (Kayangel, Ngeruangel, Helen's Reef)
- ✓ Babeldaob is the 2nd largest island in Micronesia, after Guam, but Guam has no mangroves!
- ✓ Ngaremeduu estuary is the largest estuary in Micronesia.
- ✓ Lake Ngardok is the largest freshwater natural lake in Micronesia.
- ✓ Babeldaob has the largest undisturbed forest in Micronesia.
- ✓ Palau has the most diverse selection and greatest number of marine lakes out of any country in the world.
- ✓ Palau has >400 species of hard corals and >300 species of soft corals, the most in Micronesia.
- ✓ Palau has >1,300 species of marine fish and 63 species of freshwater fish, the most in Micronesia.
- ✓ Palau has 7 of the world's 9 species of Giant Clams.
- ✓ Palau has 8 endemic species of bird (found nowhere else in the world), the most in Micronesia
- ✓ Palau has an endangered population of dugong (mesekiu) or sea cow, the only group in Micronesia.
- ✓ The Hawksbill turtle (endangered species) has it is most important nesting sites in Palau.
- ✓ Palau has a sub-species of Fruit Bat found nowhere else in the world.
- ✓ The Micronesian Megapode is only found in Palau and the Marianas.

Information Source: Palau Conservation Society Interesting Facts About Palau Fact Sheet



PVA

2.10 Dive Sites Descriptions

In a study conducted by Palau Conservation Society (2001), dive guides were asked to identify the dive sites within the Rock Islands that they considered to be the most commonly used and requested in the dive industry. The following section attempts to outline the top dive sites that were identified by tour guides. There is no fishing, no take, and no harvesting year round for all dive sites in the Ngemelis complex (Blue Corner and Holes, New Drop Off, and Big Drop Off), German Channel, and Ngerumekaol.



Ngerumekaol (Ulong Channel)
Ulong is a false channel eroded into the barrier reef west of Ulong Island. The dive is usually done on an incoming tide wherein the wall is on the left, as divers approach the mouth of the channel where gray reef and white tip sharks congregate in the current. Along the wall, between 15m/50ft to 18m/60ft a marvelous drop-off showcases schooling spadefish, gold spotted trevally chasing bigeye scad, dogtooth tuna as well as the shark species previously mentioned. Along the channel one usually encounters sharks that seem to be constantly on the lookout for food. Looking up to the left divers will notice larger schools of black snapper, big eye trevally, and black spot barracuda. Upon reaching the mouth of the channel, divers usually hook in at either side of the channel at a depth between 15 and 18 meters to watch some real shark action. Along with the sharks, tunas and a vast variety of other pelagic fish are frequently seen hunting in the blue. A stop is usually done a few minutes before drifting into the channel. The ride through the channel at an average depth of 15 meters is like a high-speed amusement park ride with lots of small reef fish, occasional sharks, threadfin pompano, various species of grouper, and Barramundi cod found along the way. There are also soft corals, sea fans, and rarely seen lettuce coral. The dive nears its end as the channel widens and deepens making an ideal spot for a safety stop while still having plenty to observe. Divers may still see garden eels, sleeping sharks on the bottom, and schools of barracuda with an occasional gray reef shark cruising within them. There is a multitude of additional sea life, which may be seen at any given time while diving the channel. The channel is closed each year between the months of May-July due to the grouper aggregations. During this time thousands of grouper move to this site to spawn around the new moon peaking during June, July, and August. Overall visibility for this dive site is excellent ranging between 15m to 25m.

Yikrel a Ikulaol (Blue Corner)
Blue Corner is the most famous dive site in Palau due to consistent shark and other pelagic fish action. The corner is a shallow plateau pointing westward within the Philippine Sea. High currents running across the plateau generate an amazing food web. Sharks aggregate at Blue Corner due to the high currents. Gray reef and Whitetip sharks surf the currents allowing extremely close views for divers and photographers as they are hooked into the reef. Sharks are generally found on the edge of the plateau, along with king mackerel, dogtooth tuna, and giant and bluefin trevally, where the currents are stronger. These species will often be spread out over the plateau during

weak or non-existent currents. Inside the plateau Napoleon wrasse, schooling big eyed trevally, barracuda, anemones, anemonefish, leaf fish, lion fish, turtles, a resident spotted eagle ray, and others can found on a regular basis. Usually the dive ends by drifting off the plateau into blue water for a safety stop. Sometimes a large school of blackfin barracuda, along with other pelagic species can be found out in blue water. The dive is very popular so the ideal time to dive this site is either early or late in the day in order to have the site to yourself. It is recommended that diver's do this site at least twice while in Palau, once on the incoming tide and once on the outgoing tide. Visibility usually ranges from 18m to 50m.

Bkul Chotuut (Big Drop Off)
Done on either incoming our outgoing tide, this is one of the more famous wall dives in Palau. Usually a mellow drift dive along a vertical wall covered in many soft corals and sea fans, sponges, anemones, and small reef fishes. Quite often turtles are seen feeding along the wall. Purple headed filefish, longnose hawkfish, schools of squarespot fairy basslets are seen here. Schools of surgeonfish, parrotfish, angelfish, and butterflyfish are common. Even safety stops are exciting here, for the reef is teeming with sea fans, anemones, spotfin and clearfin lionfish, and moray eels. On top of the plateau, in rather shallow water, many new corals are growing and this may be one of the healthiest looking shallow reefs on the barrier reef. Visibility usually ranges from 18m to 50m.

Mesikm (German Channel)
German Channel is a manmade channel cut out of an inner reef within an inner lagoon. The best time to dive at the channel is during an incoming slack tide when manta rays may be feeding or being cleaned at a couple of cleaning stations. Divers descend to about 20m/65ft and swim crosscurrent along sandy bottom. Feathertail stingrays and thorny rays may be seen. Whitetip and gray reef sharks may be either cruising or being cleaned at cleaning stations. Microscopic organism called plankton funnel into the channel, and are a food source that manta rays regularly feed upon - especially late in the day on an incoming tide. After watching mantas or sharks or exploring coral heads divers drift into shallow part of channel where leopard sharks sleep and turtles feed. There are certain times of the year when the rays are more common but resident rays are seen year round.



Yikrel a Bub (Blue Holes)
This site has a large cavern with four holes on top of the reef allowing natural light to filter in. The cavern and holes were formed years ago when water levels were much lower than today. When the sea is calm, divers usually enter the cavern through one of the holes on top of the reef flat and descend slowly through a wide tube that has many lace hydroids growing on the walls. Soldierfish and fairy basslets are found inside the tube. Once divers descend to about 18m inside the cave they will notice thick beams of natural light entering from the four skylights above. The bottom of the cavern consists mainly of sand and rubble. No current is present inside the cavern. Two exits are readily apparent. The larger one is between 20m and 60m and the other exit is around 15m. Divers usually spend 10-15 minutes inside the cavern, and then begin drifting with the wall on the left towards Blue Corner (only possible during outgoing tides). There is almost always an eddy of water just outside the holes. Divers will have slight current against them for 10 minutes before being pulled towards the Corner. Going slowly divers will notice lots of large marbled groupers, purple queen anthias, nudibranchs, one spot and humpback snapper along the wall. Whitetips may often be found sleeping in crevices along the wall. If the tide is incoming then divers may spend more time inside blue holes and drift with the wall on their right once exiting. Towards the back of the cavern there is a small entrance to a cave (called the Temple of Doom). The cave goes back almost 100m into the reef and no natural light can be seen once entering. Two lines have been set inside the cave. The silty bottom drops to 40m and the top goes up at least 18m. There are two complete turtle skeletons inside the cave that are the only attraction. Proper cave diving training is recommended for all divers.

Yikrel a Cheleu (New Drop Off)
There is a shallow plateau south of blue corner along the barrier reef. Drop in with the wall on your left. There are *Dendronepthya* soft corals, sea fans, and large anemones along wall. Gray reef sharks and white tip sharks cruise with the current along the edge of the drop-off. Schools of redtooth triggerfish, pyramid butterfly fish, and fusiliers are out in the current along the wall. After several minutes of drifting, divers come upon several cuts in the reef where circular currents called eddies occur. Divers feel the current for a minute or two, and possibly a down draft inside these cuts. Divers may hook in on the edge of the plateau, from 15m to 18m to watch shark aggregations. Large Spanish mackerel are commonly found with the sharks. On top of plateau, that is about 10m, there are schools of blue-lined and long-spot snapper, clown triggerfish, peach fairy basslets, Napolean wrasse, and blackspot barracuda. Leaf fish can be found in sand/rubble cuts and flame angelfish are uncommon. Divers must be especially careful of nesting triggerfish around full moon, as they get aggressive and are known to nip at fins.

Bkul a Chomruchel (Peleliu Corner)
The southern reef in Peleliu extends far outward from the island, and eventually slopes to a sharp corner. On the western side of the plateau, there is reef cut at a depth of 15m. At this site, high currents hit the wall and go up and over the edge onto the plateau. Sharks aggregate at the cut surfing the currents along with king mackerel, yellow-fin surgeonfish, and redtooth triggerfish. It is the rather strong current that brings all these predators to this area. At the start of the dive, divers generally drift along Peleliu wall for a short distance, and then use the reef hook at the cut to watch the action. After unhooking, divers usually drift into the shallower part of the plateau, also known as the Peleliu Aquarium. When the current is right, divers may begin their dive at

the cut and drift along the edge of the plateau down to the corner, which is at about 25m. Peleliu cut and corner are actually two different dive sites, but can be done as one dive. The variation or combination of these dives is usually done with more experienced divers who want to see some big action and who do not mind diving while swimming against and fighting the rather fierce currents that are present here. Visibility is usually excellent, ranging from 20m to 40m.

Bkul a Ngerngas (Turtle Cove)
This dive begins by dropping into small blue hole on top of the shallow reef flat. Walls of hole have small soft corals, hydroids, and sponges. Drifting with the wall on your right towards the corner, usually takes 20 minutes. There are large schools of fairy basslets and small reef fish. Close to the corner there are schools of Thompson's surgeon fishes, pyramid butterflyfish, and redtooth triggerfish. Along the wall a large school of black snapper may congregate with close view of the divers. A handful of gray reef and whitetip reef sharks around the corner, with schools of big eye trevally. Giant trevally cruise up in shallow water. Near the end of the dive, divers ascend to a plateau, which is like a giant aquarium. Divers can expect to see beautiful anemones, small reef fish, turtles, and sometimes a blacktip reef shark. Visibility is usually good, ranging from 10m to 30m.

Siaes (SiaesTunnel)
Just east of Siaes Corner, is a straight swim down a vertical wall to the entrance of a large tunnel. The tunnel is like a giant worm hole with three holes. Usually little current is present inside the tunnel though it may pick up once the diver exits. Plenty of natural light filters inside the tunnel though a flashlight is recommended to see soft corals, cup corals, small fish, and inverts on walls and ceiling. There are many sea fans and black coral in the window and exit of the tunnel where they can filter plankton out of the current. The tunnel is rather wide, about 15m across, with a sandy/rubble bottom sloping up from the entrance to exit. On the bottom, one can find various species of dartfish, gobies, frogfish, and nudibranchs. The top of the tunnel has lionfish, Colin's angelfish, and burgess butterflyfish; many of which can be seen at no other dive sites.

The Wrecks of Palau
Most frequently visited wrecks are listed below with a brief description of each. ALL wrecks are fragile, non-renewable heritage resources. Once damaged or disturbed they cannot be replaced. Visit plane/ship wreck sites safely. Do not interfere with the site and avoid accidental or deliberate damage to the wreck. Palau offers many World War II sites to explore, never touch or take away any artifacts from these areas. Not only can it be dangerous, it is illegal to remove or take anything from WWII or historical wrecks. Strict penalties will be enforced. WWII wrecks are protected by national law under the 19 PNC Section 301, "Lagoon Monument Act". For more information you can contact the Bureau of Arts & Culture.

Bichu Maru
A 110m/367ft long army cargo ship that lies at 10m/30ft to starboard rail amidships.

Iro
A 140m/470ft long Japanese navy fleet oiler that is positioned as follows: bow in 20m/65ft, stern in 25m/85ft, forward mast up to 10m/35ft, and bottom at 40m/130ft.

Teshio Maru
A 100m/321ft long Japanese army cargo ship that lies at 25m (75ft).

Helmet Wreck
A 58m/189ft long cargo ship that is positioned as follows: stern in 15m/50ft, bow dips to 35m/110ft.

Zero Fighter
A small single-seat fighter that lies at 20m/65ft.
Jake Seaplane
A seaplane that is 11m/37ft long and lies at 15m/50ft.

The USS Perry
This 115m/380ft long war ship that was the first U.S. War ship hit by a land mine while mine sweeping, and lies at 72m/240ft to 78m/260ft.



Some Others Wrecks in Palau:

Amatsu Maru
A standard fleet tanker that lies at 41m/135ft.

Buoy 6 Wreck
An identified 100ft long Japanese fishing boat that sank upright and lies at 20m/65ft to 23m/75ft.

Chuyo Maru
A 272ft long army cargo ship that lies upright on a 35m/120ft bottom just west of Malakal Island.

George Bush Wreck
A 150ft Japanese Armed Trawler was sunk by former US Pres. George Bush and lies at 12m/40ft.

Gozan Maru
A 305ft long naval cargo/transport vessel, almost completely salvaged with a debris field on the bottom that is at a depth of 20m/60ft.

LST Type I
A 292ft long Japanese landing ship, designed to carry landing crafts, tanks, midget submarines, cargo, and troops that lies at 20m/70ft to 30m/85ft.

Samidare
An Imperial Japanese Navy Destroyer that lies at 5m/15ft to 10m/30ft.

Sata
Sister ship to the Iro and lies completely capsized on a 36m/120ft bottom. No salvaging was done on this wreck which sank on March 31, 1944. The ship is 470ft long like the Iro.

Kamikaze Maru
This motor torpedo boat tender is sunk about a mile south of the Iro on a 35m/115ft bottom. The stern of the ship is in very bad shape having had a large explosion destroy most of it.

Ryuko Maru
A 321ft long Japanese Navy cargo steamer that sunk during air raids lies upright on a 36m/120ft bottom, bow pointed to the northeast.

Zero Fighter
Found upright in a few feet of water a few kilometers south of the single-seat fighter located southeast of Koror. It is a popular snorkel site but only accessible during high tide.

Information Source: Palau: Dive Sites, History, and Culture

There are several great sources of information about Palau's dive sites to refer to Including the following:

Bailey, Dan E. 1991. World War II Wrecks of Palau.
Barbour, Nancy. 1996. Palau
Lindermann, 1988. Desecrate I. The Shipwrecks of Palau.
Navot Bornovski, Shlomo Cohen and Yoram Tatzyat. 2002. D-Log Palau Interactive CD-ROM.
Tim Rock and Francis Toribiong. 1994. Diving and snorkeling guide to Palau.
Mandy Thijssen- Etpison. 2004. Palau-Natural History

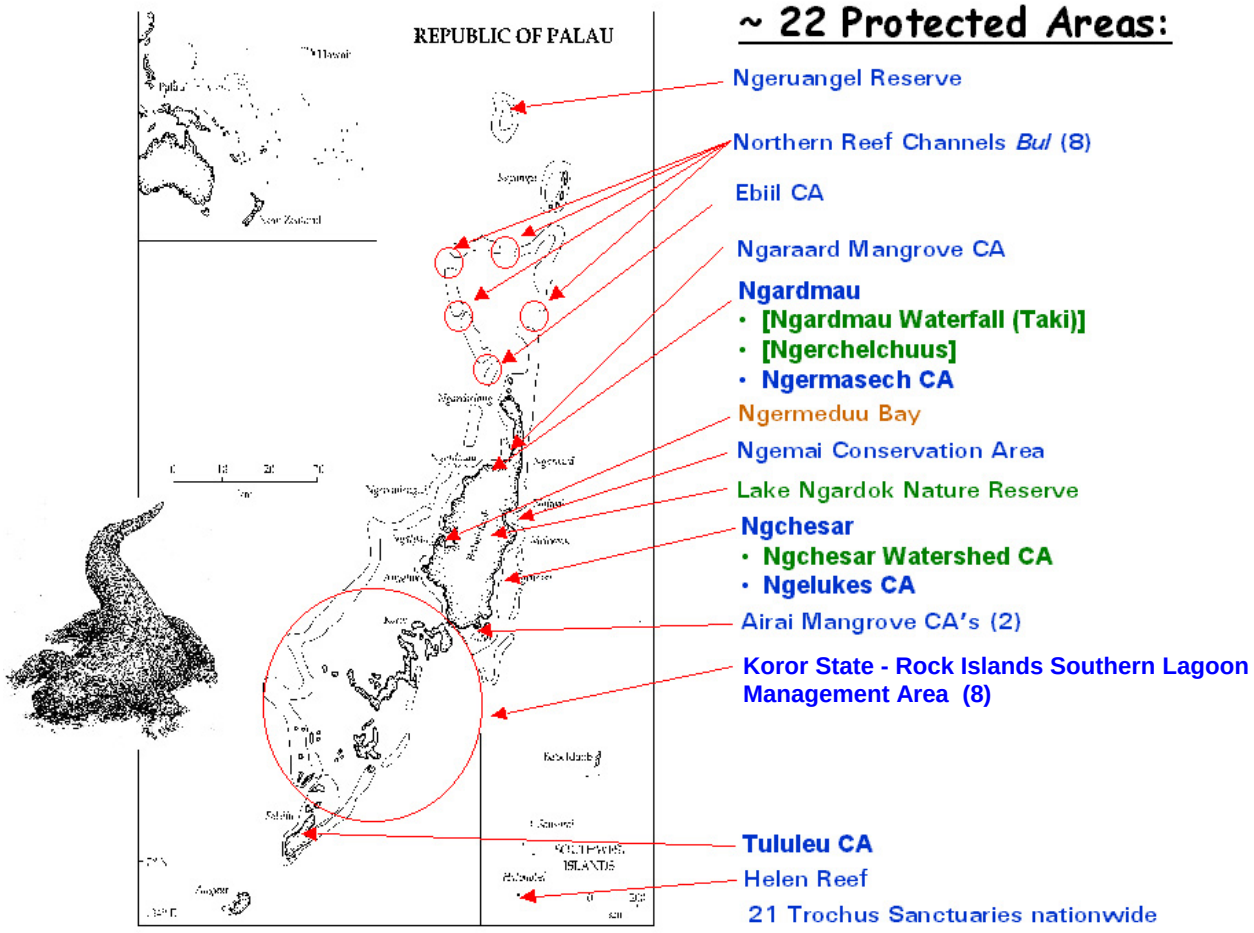
Chapter 3: Marine Environment





3.1 Conservation Areas of Palau

Palau is blessed with abundant and beautiful natural resources, which are coming under increasing pressure from human use and exploitation. Tourism, erosion, over-fishing, pollution, invasive species and other environmentally-destructive practices currently threaten the natural resources on which we base our livelihoods. The completion of the Babeldaob road is expected to bring new business development, population shifts and other changes that will affect all of Palau.



Recognizing the value and vulnerability of our natural resources, communities throughout Palau have designated certain areas of land and water to be specially managed as 'conservation areas'.

Local communities and traditional leaders have always played an important role in resource conservation in Palau. Traditional prohibitions, or *bul*, against certain harvesting practices are still being used to protect important natural resources. The merging of traditional and modern laws has been adopted by several states to strengthen their conservation efforts. Since 1994, 12 new formal conservation areas have been created by state law.

Though most conservation areas are for the protection of marine resources, Melekeok has set aside the inland Ngardok Lake for protection. Ngardmau was designated a mountain and a waterfall for protection, ensuring one of our tallest peaks and largest waterfall are protected.

Newly designated in 2003 were a fringing reef and seagrasses in Ngchesar and an area encompassing reef, seagrass and mangrove in Ngardmau.

Information Source: Palau Conservation Society Conservation Areas Fact sheet

3.2 Watersheds

Although watersheds are not strictly marine habitats, they directly influence our coastal environment. The impacts of any activity in our watersheds affect our reefs in some way.

3.2.1 What is a watershed?

A watershed is an area that water travels through, from where it fell as rain to where it enters a watercourse and then the ocean. No matter where you live in Palau, whether it is up in the hills, next to the mangroves, or by the sea, we all live in a watershed. Each watershed is separated by the hills or ridges that direct the flow of water into a river or stream.

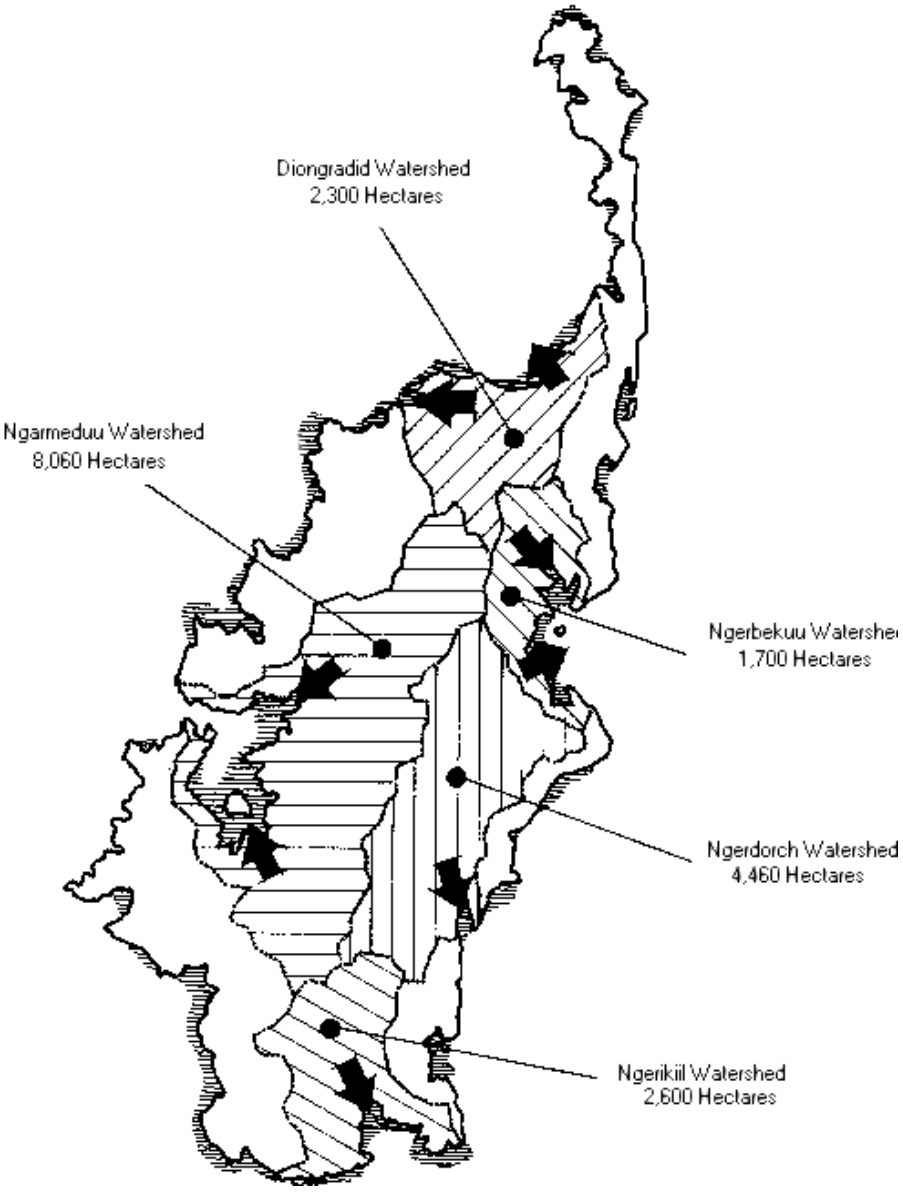
3.2.2 Why are watersheds important?



Water is the source of all life. Protection of watersheds is thus important for people as well as plants and animals. Water running from watersheds has many uses. One of the most important uses for people is for drinking water. For example, the Ngerikiil watershed supplies water to Koror and Airai, so keeping the water from this watershed clean is essential for human health. Over 70% of the rain that falls on the ground in Babeldaob will end up in the ocean. The quality of this water can have a major effect on the health of our reefs and fisheries. Pollution of the water from sewerage, soil, chemicals or other sources can seriously damage the reefs.

- *Local residents of Ochelochel, Airai, have reported that the mangrove areas that used to supply them with fresh fish are now too silty and the marine life that used to thrive is now mostly gone.*
- *Fish species such as the udech (emperor) and klsebuul (rabbitfish) are now rarely found.*

- *A study done by Palau's Environmental Protection & Quality Board (EQPB) in 1999-2000 found that the Ngerikiil River contained bacteria (fecal coliform) that exceeded the acceptable limits for its use as public water. Fecal coliform bacteria are found in the intestines of warm-blooded animals such as pigs, dogs, cows and humans and can cause serious sickness in humans.*



3.2.3 How can we keep our watershed healthy?

1. **Remember what you do in a watershed will almost always affect someone else as well as yourself.** Water runs downhill, so any pollution caused by someone on the slopes or upper watershed will always move downstream and affect other people drinking water or using fisheries.

2. **Reduce unnecessary burning.** Burning results in nutrient loss from the soils, erosion, and pollution of streams. Use alternative methods wherever possible for clearing land for crops or removing weeds around your house. Avoid burning savannah or forest areas.
3. **Maintain buffer zones (vegetation barriers) along streams and rivers.** Keeping vegetation along streams helps filter out sediment and pollution before it reaches the water. Avoid cultivating, clearing vegetation, and animal grazing within 50ft of small streams and 150ft of larger rivers.
4. **Minimize pollution from your house or farm.** Prevent contamination of drinking water by locating piggeries and septic tanks away from streams and keeping farm animals out of streams. Keep pesticides and fertilizers away from streams. Store all chemicals in a secure area.
5. **Minimize soil erosion.** Adopt farming practices that conserve soil and prevent erosion.
6. **Encourage careful development.** Promote careful land-use practices in your local community. Ensure that farm workers are properly trained. Seek advice on minimizing negative impacts and get appropriate approvals for all developments.
7. **Protect all mangroves.** Avoid clearing or filling mangrove areas.
8. **Monitor water quality in streams.** Let EQPB know if you notice any changes.

Information Source: Palau Conservation Society Watersheds Fact Sheet

3.3 Mangroves

3.3.1 What are mangroves?

Mangrove forests play a critical role in the ecology and economics of tropical coastline communities, yet they are grossly undervalued and overexploited in most regions where they are found. About half of the world's mangrove forests have already been destroyed or severely degraded by human activities such as logging, road construction, drainage operations, hydroelectric development, or conversion to agriculture or aquaculture. While the importance of forested wetlands to terrestrial and marine ecosystems is widely recognized in several industrialized countries with policies to mitigate mangrove destruction; mangroves continue to be destroyed in many developing countries, including Palau.

3.3.2 Biology of Mangroves



Mangroves are trees or shrubs that are adapted to estuarine or saline environments. Mangroves have characteristic features that allow them to live in harsh environments with soft substrate (bottom type) and where they are often flooded with brackish water. Some of these unique characteristics include shallow roots that spread widely across the substrate and project

from the mud (snorkel roots) to allow absorption of oxygen in an otherwise anoxic (no oxygen) substrate. Roots extend from the branches and trunks providing better anchorage for plants on a muddy, soft substrate. Tough and moist leaves with internal water storage tissue, and in some species, slat-excreting organs maintain salt and water balance.

3.3.3 Mangroves in Palau

Mangrove forests are among the many unique ecosystems in Palau. They are found along coastlines, river banks, low coral islands, and surrounding marine lakes. Palau has eighteen species of mangrove plants including the palm tree called *Nypa* palm (*touechel*), tall *Rhizophora* trees (*bngaol and tebechel*) and ferns. Many animals make their homes in Palau's mangrove forest, including the saltwater crocodile, (*ius*), mangrove crab (*chemang*), mangrove clam (*ngduu*l), mudskipper (*temaitolok*), and the banded archerfish (*uloi*).

Mangroves in Palau, like those throughout the tropics, provide a wide range of ecological services that benefit local communities directly and indirectly. Mangroves are very productive coastal resources that are useful in many ways. The leaves of the mangrove trees fall into the water and provide food for animals like crabs and fish. Much of this food is also carried out to the coral reefs and lagoon where it becomes a source of nutrients for the fish.

Roots of the mangrove trees provide shelter for many animals. Open water and reef fish come to reproduce in the forests and many juvenile fish remain there taking shelter before going to live on the reef when they are larger. Mangroves serve as nursery areas for valuable reef species including snappers (*kedesau*), rabbitfish (*meas*), mullet (*kelat*), emperor fish (*udech*) and goatfish (*bang*). Other animals that make their home in the mangrove forest include some endemic and threatened species such as the owl (*chesuch*) and fruit bat (*olik*). The mangrove forests are a critical habitat upon which these species depend for survival and if they are destroyed, the future of these species will be at risk.

Mangroves act as a buffer between the clear waters of the fringing reef and the silt-laden run-off from Palau's urban towns and red mountain peaks. When debris from the land gets washed into the mangroves, the swamp traps the pollution and sediments, leaving clean water to go out onto the nearby reefs. Their roots form a giant sieve, trapping silt that might otherwise smother the delicate corals. As long as there are limited amounts of sediment entering the mangroves, and no poisonous waste from industries or farms, the mangroves act as an excellent filter system.

Information Source: PICRC Publication 02-021 Mangrove Fact Sheet

3.4 Seagrass Beds

Palau has extensive seagrass beds that grow in the shallow waters around the coast. They are vital areas for baby fish and many animals such rabbit fish, sea cucumbers, shellfish, crabs, urchins and turtles and dugongs. Seagrasses are just like plants that grow on land, they produce flowers, fruits, and seeds, and have roots. Palau has 10 species of sea grasses. Often people don't realize how important these underwater 'fields' are for supporting our commercial and subsistence fish species and endangered turtles and dugongs as well as keeping our waters clear. Around Palau today, many States have started coastal development projects, including dredging, which smothers the seagrasses and makes the water cloudy, so that they eventually become sick and die. We don't see the effects until several years later, when people start wondering where the sea cucumbers have gone and why the fish stocks are declining.



Pat Colin

Information Source: CRC Reef Research Centre: Tropical Topics

3.5 Coral Reefs

3.5.1 What are coral reefs?

Reefs are the result of a fine balance between the formation and consolidation of limestone (produced by coral and marine algae) and destruction by mechanical and biological activities.

Found only in the shallow warm waters of the world, coral reefs require:

- Annual mean temperature of 22-29'C for reef growth
- Clear water to allow adequate light for photosynthesis
- Firm substrate for attachment
- Stable salinity or salt content (This is why reefs don't occur near river outfalls.)
- Low sedimentation (Sediments reduce the amount of light and can smother corals.)
- Low nutrients (increased nutrients allow algae to grow over corals)



3.5.2 Coral

Characteristics of coral:

- ✓ Colonies consist of many individual coral polyps
- ✓ Coral polyps have only a single opening for both food and wastes
- ✓ The opening is surrounded by tentacles
- ✓ Hard corals secrete limestone skeletons
- ✓ Coral reefs are made up of colonies of individual animals called polyps. A coral polyp is a simple jellyfish-like animal living in a cup of limestone
  .

Role on the Reef

Coral reef structures are composed mainly of the dead limestone skeletons of previous generations of corals. Only the thin outermost layer of the reef is alive with colorful coral polyps. The structures built by corals provide a framework to the coral reef community, supplying a home for creatures like shellfish, lobsters, crabs, sea stars, and fish.

Feeding

Coral colonies are sessile or stationary. Therefore, they have to catch food that is drifting by. The stinging cells that cover the tentacles of the corals capture plankton. However, the main source of food for corals doesn't come from this prey, but rather from the sun. Coral polyps live in a symbiotic relationship (benefit from one another) with single-celled algae called zooxanthellae (pronounced zoo-zan-thel-ee). Zooxanthellae live in the tissue of coral polyps, and like all plants, they produce food using the sun's energy, including sugars and starches. Polyps utilize these products as food. In return polyps give zooxanthellae a place to live and their wastes to use as nutrients.

Defense

Space is a limited resource on the reef, and corals must constantly fight each other to survive. There are a number of ways by which corals try to out-compete their neighbors. Growing over neighboring corals cuts out the precious light needed for their zooxanthellae. Some species simply digest their neighbors or use long tentacles called sweeper tentacles to kill others around them.

Reproduction

Colonies of coral start with just one coral polyp. This 'founder' polyp reproduces asexually (on its own) through a process known as budding. The new polyp is genetically identical to the original polyp. This process is repeated over and over throughout the coral colony's life as it increases in size. As hard coral colonies grow, layers of limestone are laid down and the polyps 'move' up to the new layer. The exact rate at which the coral colonies grow varies amongst species.

Staghorn (*Acropora*) corals can grow 3-10cm each year with the massive *Porites* corals growing an average of 1-3cm per year.



Many corals reproduce sexually just once a year during a mass spawning. In Palau, it appears from research conducted by the Palau International Coral Reef Center that the peak spawning times for most species of corals are between March and May or September.

Usually, spawning occurs 3-5 days after the full moon. The process actually begins six months before as the eggs and sperm start to develop within the polyps. Mass spawning usually lasts about a week, with different species of corals spawning at different times during the night and on different nights. Eggs and sperm float on the water's surface, where they combine and develop into a planula, the free-swimming planktonic larval stage of a coral.

Depending on the coral species, the planula may stay as part of the plankton from weeks to months. When it is time to settle, the planula attaches itself to a vacant patch of reef and starts to grow into the 'founder' polyp for a new coral colony.

Human Impacts and Use

Coral reefs are under threat world wide. Increased nutrient levels in the sea, caused by agriculture, industry and urbanization supports algal growth. Algae may eventually out – compete and smother corals. Increased sediment loads from rivers and run-off not only decreases water clarity, but also physically smothers coral. On a localized scale, anchors and divers, particularly in high-use areas can cause high levels of damage.

Coral Color

Many visitors are surprised that corals do not appear as colorful as they do in pictures in magazines. This is because these photos were taken using a flash.



PCS

White light is made up of all the colors of the rainbow, but water filters out these colors at different depths with red and yellow disappearing first, leaving green and blue. This gives the reef a predominantly blue-green appearance at depths over 10m. The bright colors of corals can be seen in the shallows, but in deeper water, an underwater flashlight or flash on a camera is needed.

Coral Identification

The easiest way to classify hard corals is by their appearance as follows:

- Branching
- Table
- Plate
- Boulder
- Vase
- Bushy
- Solitary
- Mushroom



Trying to identify corals to a species level is very difficult. What makes coral identification difficult is that a single species may appear in a branching form in calm water and as a plate coral in another area. Local environmental conditions, such as wave action, light levels, and the amount of sediment in the water affect the shape of the coral – it grows to suit local conditions.

Soft Corals and Sea Fans

Soft corals lack the hard external limestone skeleton therefore their soft body is defended by chemicals called terpenes which make the corals toxic and bad-tasting to predators. Some species also have sharp needle-like sclerites inside their tissue that help discourage predators. In addition to their swaying bodies, soft corals can be distinguished from hard corals in that they have eight tentacles per polyp, with each tentacle having side branches giving it a feathery appearance. Hard corals have tentacles usually in multiples of six.

Sea fans, also called gorgonians, like soft corals, have only eight branched tentacles per polyp. Their colony is supported by a flexible skeleton made of a substance similar to fingernails called gorgonin.

Coral Eaters

Probably the most famous of all coral eaters is the crown-of thorns starfish (COT). This type of starfish pushes its stomach through its mouth to digest coral polyps from the coral skeleton. Other predators include the drupella snail, which feeds by scraping polyp tissue from the skeleton, and a number of species of fish such as butterfly fish and the beaked leatherjacket which pick at individual polyps.

Human Uses of Corals

- ✓ Researchers from the Australian Institute of Marine Science have discovered that corals produce sunscreen with an equivalent sun protection factor (SPF) of 50 to protect them during exposure to the sun at low tide.
- ✓ Some corals are being used to replace bone in humans where the bone has been damaged through accident or disease. The coral has the same porosity as human bone, allowing blood vessels and nerves to grow into the implant, increasing repair strength and rate of recovery.

Information Source: Great Barrier Reef Marine Park Authority REEF MANUAL: Understanding Essentials Communications 1999)

3.6 Threats to Coral Reefs

3.6.1 Predators on Corals

The COT is an unusually large starfish and can grow to more than 80cm in diameter. It has up to 21 arms, covered in long venomous spines.

Breeding
Recent research by David Idip Jr., a Researcher at the PICRC, has revealed **two** spawning times for COTs, March-June and September, which seem to be associated with a decrease in water temperature.

They release eggs and sperm into the water. When the eggs are fertilized, they become larvae which spend 2-3 months drifting in the ocean currents. The juveniles settle onto the reef when they are about 1-2mm across. They live among rocks and rubble on the reef and are almost invisible until they are about 6 months old.

A COT can breed for 5-7 years and each female can produce up to 250 million eggs in a single spawning season. The starfish gather in the shallow water to spawn which increases the chance of fertilizing the eggs. So a small population of COTS could potentially produce a very large number of offspring.

Feeding
Young COTS eat encrusting (coralline) algae which is common among rocks and rubble on the reef. At about 6 months of age, they start to eat coral and begin to grow more rapidly. Over the next two years, the starfish can grow from 1cm to 25cm in diameter. When there are few COTS, they tend to be hidden under corals during the day and move into the open to feed at night. They feed mainly on coral species that they prefer, and may not eat the entire coral colony.



Pat Colin

As a result, the reef can recover quite rapidly from low levels of coral feeding. Some reefs seem to support small populations of crown-of thorns starfish for many years, with only a small reduction in coral cover.

However, when starfish occur in large numbers, there is intense competition for food and most corals will be eaten, including the less-favored species. The starfish aggregate and stay in the open, feeding night and day. During a severe outbreak, there can be several COTs per square meter and they can kill most of the living coral in an area of reef, reducing coral cover from the usual 25-40% to less than 1%.

What causes COTS outbreaks?
While there have been many theories on the causes of outbreaks of COTs, there are three theories that are supported by the scientific community. Presently these theories have neither been proven nor disproved. They are:

1. Fluctuations in the COTs are a natural phenomenon.
2. Removal of the predators (triton shells) of the COTs has allowed populations to expand.
3. Human use of the coastal zone has increased the nutrient flowing into the sea and resulted in an increase in planktonic food for larvae of the COTs. The improved survival of larvae has led to an increase in the number of adult starfish which results in outbreak

Outbreaks documented in Palau, include (numbers of starfish removed from reefs in brackets):

1969 – (14,591) – 4 locations
1971 – (1191) – 15 locations
1979 – (100,000) – 5 locations >50,000 in 12 days from Malakal Harbor
2001-2002 – (4000) from Lighthouse Reef alone

Controlling COTs outbreaks
Natural Methods: Natural controls on starfish populations include high mortality of the larvae, predation of small starfish and diseases. Adult starfish have few predators because of their tough and toxic 'skin' and long spines. There is little evidence of major diseases in COTs.

Other control methods: It is not possible to eliminate COTs from reefs where they are in outbreak densities but with sufficient effort, local areas can be protected. The method currently used in Palau involves spearing the COTS using a wooden stake and removing them from the water. In Australia, the recommended control method involves trained divers injecting otherwise harmless chemical (sodium bisulfate solution) into the starfish, which kills them within a few days. However, other starfish can quickly move into the control areas from other parts of the reef. In an area with a large population of COTs, control is usually required on a daily basis.

Information Source: Crown-of-Thorns Starfish on the Great Barrier Reef: Current Status of Knowledge, April 2001, CRC Reef Research Centre, Townsville, Australia

3.6.2 Climate Change

What is coral bleaching?

Coral bleaching is the loss of zoothanthellae from corals under stressful environmental conditions. Microscopic algae called zoothanthellae live within corals and a vital source of food in the form of sugars through photosynthesis. Zoothanthellae also contain pigments that give coral their color. While any stress can cause corals to bleach, high water temperature has been the major cause of coral bleaching events worldwide in recent decades. Zoothanthellae are ejected under stressful circumstances and without them, corals dependent upon zoothanthellae will eventually die. In addition to hard corals, soft corals, giant clams and jellyfish area also dependent on zoothanthellae and experience declines during bleaching. In 1997-1998, a major bleaching event in Palau's waters and elsewhere in the world, raised concerns about the health of the reef. With predictions that temperatures will continue to rise as a result of global warming, the future of tropical coral reefs is causing worldwide concern.

Causes of global climate change

Global climate change is the result of many complex environmental factors, but a principal cause is the increasing amount of greenhouse gases in the atmosphere as a result of human activity. The most significant greenhouse gas is carbon dioxide, which has increased in concentration by more than a third in the last 200 years due to burning of fossil fuels, and deforestation. The concentration of other gases, such as methane and nitrous oxide, and the ozone-depleting halocarbon gases have also greatly increased over the same period. Greenhouse gases in the atmosphere warm the air by trapping heat from the Sun that would otherwise radiate from Earth back towards space. The warming that results is similar to that which occurs inside a greenhouse.



Pat Colin

Over the 20th century, the average temperature of the Earth's surface rose by 0.6 degrees Celsius. According to a recent international study, it is projected to rise by another 1.4-5.8^{0}C over the next 100 years. At the same time, average sea surface temperatures have also increased, although at a slower rate. Even small changes in sea surface temperature can have a dramatic effect on global climate change. These include ocean circulation patterns, increased frequency of storm events, and rising sea levels due to expansion of warmed oceanic water and loss of ice.

The temperature tolerance limits of corals

Maximum summer sea temperatures that are just 2-3'C above normal values can kill corals. The upper temperature limit of corals depends on where they are found. The extent of bleaching also depends on the length of time that the water temperature is raised. A coral which normally grows in summer temperatures of 29'C may have little reaction if exposed to temperatures of 32'C for a few hours, but could bleach if temperatures reach 31'C for a week. It is a combination of the length of time, and the amount by which water temperatures exceed normal maximum values, that is critical in predicting the extent of bleaching.

Can reefs recover from bleaching?

When a reef is only slightly stressed, a few scattered corals will die and the effect will be barely noticeable. When a reef has been exposed to prolonged and extreme heating, most corals will die and it can take many years for the area to recover; particularly if large, old corals have been killed, for example, the huge table corals at Ngerchong Island.



Pat Colin

Corals recover as a result of growth of surviving corals, and from the settlement and growth of new coral recruits. The rate at which a reef recovers from coral bleaching depends on many factors. Recent research has shown that some reefs are more likely than others to receive large numbers of coral larvae carried to them by ocean currents. The reefs that receive large numbers of larvae can have many young corals growing on them within a few years. As a result, coral communities can recover within about 10 years. Other reefs that do not receive a plentiful supply of coral larvae will take considerably longer to recover, perhaps decades.

While a reef is recovering, if it is subjected to high levels of dissolved or organic nutrients or has few grazing animals, the reef can become dominated by algae, which inhibits the recovery of corals.

Coral Bleaching Event in Palau

The first signs of bleaching in Palau were noticed in late June of 1998 and by September bleaching was obvious and extensive. A study by Bruno et al., in November 1998 found slightly more than 50% of surface cover of hard corals to be bleached. Only 37% of hard corals were not at all bleached and most soft corals were completely bleached. A detailed study by PCS in 1999 estimated that about one-third of all hard corals and a higher percentage of soft corals had died as a result of the bleaching. The damage was found to vary greatly by area, habitat and type of coral. Some species appear to have lost more than 99% of their cover. The outer barrier reefs, where most of the scuba-diving takes place, appeared to have been hit harder than the lagoon area, where most snorkeling takes place. PCS found that about 60% of 30 surveyed sites had lost more than half of their live hard coral cover.

What can be done about climate change?

The ultimate solution to protect coral reefs would be to target the source of global climate change, i.e. a reduction of greenhouse gases emissions through reduced fossil fuel burning and increased reforestation. The extent and rate of such changes are governed by complex political and socio-economic drivers and are unpredictable.

Continued research into the causes and consequences of global climate change is important. Accurate predictions of the geographic patterns and rates of change, and the ways to respond to them must be available to governments and communities.

Information Sources:

Coral Bleaching and global climate change. Current State of Knowledge, January 2002. CRC Reef Research Centre, Australia.

Dive Tourism in Palau: Resource Use, Value and Management. Tom Graham, PCS, June 2001.

3.6.3 Other Threats

An estimated 30% of the coral reefs worldwide are already severely damaged, and close to 60% may be lost by 2030. There are no pristine reefs left. Until recently, the direct and indirect effects of over-fishing and pollution from agriculture and land development have been the major drivers of massive and accelerating decreases in abundance of coral reef species, causing widespread changes in reef ecosystems over the past two centuries. With increased human populations and improved storage and transport systems, the scale of human impacts on reefs has grown exponentially. For example, markets for fishes and other natural resources have become global, supplying demand for reef resources far removed from their tropical sources. On many reefs, reduced stocks of herbivorous (vegetarian) fishes and added nutrients from land-based activities have caused ecological shifts, from the original dominance by corals to an abundance of fleshy seaweed. These changes to reefs, which can often be managed successfully at a local scale, are compounded by the more recent, superimposed impacts of global climate change. Future changes in ocean chemistry due to higher atmospheric carbon dioxide may cause weakening of coral skeletons and reduce the accretion of reefs, especially at higher latitudes.

Information Source: Climate Change, Human Impacts, and the Resilience of Coral Reefs T. P. Hughes et al. SCIENCE VOL 301 15 AUGUST 2003

3.7 Marine Lakes & Jellyfish

Marine Lakes: Tour Guide Training Manual
By Laura E. Martin, Michael N Dawson, Lori J. Bell
Coral Reef Research Foundation

What is a marine lake?

The limestone 'Rock Islands' of Koror and Airai States are dotted with a little known but unique type of marine ecosystem called a marine lake. Simply defined a marine lake is a body of seawater surrounded by land. Although generally unrecognized as such, marine lakes, like coral reefs and mangrove forests, are a widespread type of marine ecosystem.

Marine lakes form where seawater flows through channel, tunnel and fissure ridden landmasses to fill depressions in the landscape that are lower than sea level. Imagine a colander sitting in a sink partly filled with water. The colander is the tunnel-riddled island, its center the lake, and the water outside the colander the ocean. Marine lakes cannot form where there are no depressions lower than sea level and the land is relatively impermeable to the ocean. This is why Babeldaob lacks them.

All marine lakes retain connections to the ocean via tunnels or channels through the encircling rock and thus, experience tides. The number, size and length of the channels through which water must flow determine the degree to which water and organisms are exchanged with the ocean. Broad, short tunnels facilitate high exchange and are characteristic of marine lakes with coral reef like communities. Longer, less direct connections isolate the lake and its organisms from the sea. These lakes typically support mangrove communities and organisms able to tolerate lower salinity waters that result from dilution by rain.

In 1999, Koror State legally defined a marine lake 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 the ocean waters" (KSPL NO. K6-95-99). Under this definition, Koror State recognizes about 50 marine lakes in its waters. Another commonly offered number is about 70. In practice, the tally will depend upon the specific definition used.

How did the marine lakes form?

All of Palau's marine lakes can be thought of as young lakes in comparatively old rock islands. Palau's remarkable rock islands formed many millions of years ago as tectonic forces slowly pushed coral reef out of the ocean, creating land with the topographical characteristics of reefs: a complex network of high ridges and steep faces interspersed with depressions, all formed of limestone perforated by channels and fissures.

The marine lakes are the product of the porous nature of the islands in relation to height of the surrounding ocean (sea level) which, over the last 20,000 years, has changed profoundly in response to changes in the earth's climate. During the earth's most recent

glacial period, approximately 20,000 years ago, vast amounts of water formed massive glaciers. Consequently, sea level was over 100 meters lower than today. During this period, Palau's lagoon was dry and Palau was a single giant, jungle covered island from the tip of Babeldaob to Peleliu!

As climate subsequently warmed, the glaciers gradually melted returning water to the sea. Approximately 10,000 to 12,000 years ago, marine lakes began to form as sea level reached a height sufficient to begin flowing through the channels and fissures of the rock islands to flood depressions within. (Imagine placing the colander in an empty sink and then filling the sink with water.) The deepest lakes formed first, shallow lakes followed as sea level continued to rise. Thus, the age of a lake is directly related to its depth.

ONGEIM'L TKETAU (JELLYFISH LAKE)

Ongeim'l Tketau (translates as Fifth Lake) also commonly known as Jellyfish Lake, is the most well known of Palau's marine lakes. Visitors from around the world visit the lake to see its spectacular population of golden jellyfish (*Mastigias papua eptisoni*)

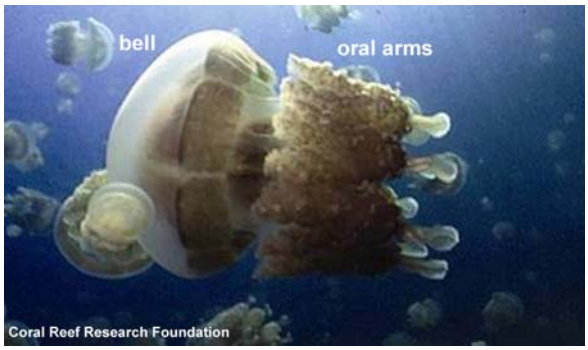
Jellyfish Lake is typical of the more isolated type of marine lake. Mangrove communities dominate the intertidal and its surface waters are diluted by rainfall to a salinity approximately 75% the strength of full seawater.

The lake reaches 100 feet at its deepest point, however, plant and animal life are restricted to the top 45 feet of the lake. Below this depth, the water lacks oxygen and, instead, contains high concentrations of the toxic compound hydrogen sulfide, which precludes all organisms that require oxygen to live, including humans. Bacteria inhabit this dark, poisonous layer. The hazards presented by this compound are responsible in part for the ban on SCUBA diving in the lake.

How did the jellyfish get into the lake?

Jellyfish Lake is approximately 10,000 to 12,000 years old. With the exception of the recently and likely anthropogenically introduced sea anemone (see below), the jellyfish, like the lake's other current inhabitants, are all descendents of tiny, likely larval, colonizers that were washed through tunnels and channels into the lake as it formed.





Typical lagoon golden jellyfish (left) from Risong, a close relative of Ongeim'l Tketau's *golden jellyfish (right). The rounded end of the jellyfish is commonly called the 'bell' and the frilly looking structures trailing the bell are called 'oral arms'. This name reflects their function. They are covered with stinging cells and thousands of small mouths (hence the term oral). As the medusa swims forward by contracting its bell, water flows across the oral arms and small organisms (plankton) are captured by stinging cells and ingested by the mouths. The structures trailing from the ends of the oral arms are called 'clubs' and are generally much shorter in lake medusae. Their function is unknown.*

Interestingly, the ancestors of the golden jellyfish that live in the lake can be seen today inhabiting coves around the archipelago. Lagoon and lake golden jellyfish share many features including their source of energy. Like corals, both lake and lagoon jellyfish get most of their energy from microscopic algae living in their tissues. Like land plants, the algae use the energy of sunlight to produce the sugars (energy) necessary to grow and reproduce. They share some of the sugars they generate with their jellyfish hosts. These algae also confer both types of jellyfish with their color, which is reflected in their common name, the golden jellyfish.

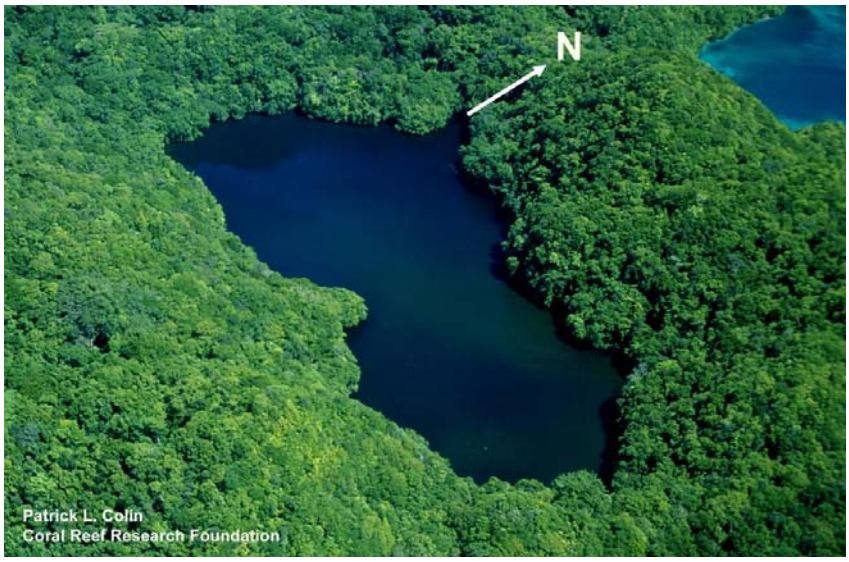
The fact that both lagoon and lake golden jellies have algae also indicates that the commonly repeated story - that the lake jellyfish's relationship with algae originated in the lake in response to a lack of food (i.e. the original founding jellyfish lacked algae) - is a myth. The original colonizing jellyfish already depended upon algae for energy. Similarly, the jellyfish in the lake did not lose their sting as their dependence upon algae for energy evolved. Both lake and lagoon golden jellyfish have a mild sting. These stinging structures are used to capture tiny (planktonic) prey, which constitute a part of their diet.

So what makes the lake jellyfish different from their ocean ancestors?

The golden jellyfish's reliance on algae and, thus, sunlight for energy has influenced their behavior. For example, both lake and lagoon jellyfish rotate in a counter-clockwise direction as they swim which ensures algae in all tissues are exposed to the sun.

Lake and lagoon golden jellyfish also migrate on a daily basis, a behavior that serves to keep their algae in the sun. Relative to their lagoon ancestors, lake jellyfish exhibit a more complex version of this ancestral trait. This amazing behavior, the product of the jellyfish's adaptation to life in the lake, is a key feature distinguishing lake from lagoon jellies. Indeed, it also is one of the attributes that distinguishes Jellyfish Lake golden jellyfish from golden jellyfish in other lakes. No other population exhibits such a spectacular migration to produce unbelievably dense jellyfish aggregations on sunny days.

How do the jellyfish migrate?



Aerial photograph of Ongeim'l Tketau. The arrow indicates north.

If you were to snorkel in the lake just before dawn, you would find millions of golden jellyfish milling around the western half of the lake, swimming in all directions with no particular destination. All this changes at dawn (around 6 am, never much less and never much more) when, with the sky brightening in the east, the jellyfish turn and swim diligently toward the rising sun. For about two hours they swim eastward, never faltering, rarely turning, with incessant contractions of their bell, until they approach the eastern end of the lake. Here, although still stimulated to swim eastward by the rising sun, they are stopped, not by the edge of the lake, but by the shadows cast by overhanging trees, which they meticulously avoid. These jellies become trapped between swimming eastward toward the sun and swimming westward away from the shade. The millions of jellyfish that were once in the west are now packed densely around the illuminated eastern rim of the lake, with nowhere else to go.

As the day progresses, the sun passes directly overhead and then gradually begins to descend in the west, releasing the medusae from their bind. As the sun starts to track westward, the jellyfish accumulated in the east begin to follow the sun back across the lake, returning to where they started in the morning. The jellyfish swim westward until they encounter the shadow lines cast along the western edge of the lake by the sun as it descends in the west. Here they accumulate, as they did in the east, swimming around, continually avoiding the shadows, trying to stay in the sunlight and avoiding the shore.

By 3 or 4 p.m., the eastern basin which became densely packed with jellyfish between 9 a.m. and noon is again almost devoid of jellyfish as they have all returned to the western end of the lake. As the sun sets (very rapidly in the tropics), the shadows quickly move across the lake and the jellyfish can no longer swim fast enough to remain in the sunlight. Now in the shadows, and lacking any directional light by which to orient their swimming in a horizontal direction, the animals begin to swim vertically, up and down in the water column, remaining more or less in the same position with respect to the shore. This behavior keeps them away from the shore during the night.

At this time, they may swim downward and encounter the nutrient rich boundary between the lake's oxygen-less depths and oxygenated upper layer. Here their algal symbionts absorb much needed nutrients as the jellyfish continue to swim. When the sun rises the next day (but before it actually illuminates the lake's surface), the jellyfish accumulate at the surface in response to the increasing light. Once again, they mill around until the first rays of sun entice them to the east.

In summary, the jellyfish complete one round-trip migration from west to east and then back to the west every day between sunrise and sunset. At no point do they ever stop swimming - during the day or night. During the day, their swimming is either strongly directional as they migrate—eastward (in the morning) or westward (in the afternoon)—or haphazard as they mill about waiting for the sun or avoiding shadows. At night, they also swim continually, but vertically rather than horizontally as during the day. The migration is the summed result of each individual animal responding to the light cues in the same way.

Why do the jellyfish migrate?

Because the jellyfish get most of their energy from their mutualistic algae, it would make sense for the jellyfish to migrate in a manner that maximizes the time they spend in the sun and, therefore, the energy they get from their algae. However, the direction the golden jellyfish migrate in Jellyfish Lake does not maximize the time they spend in the sun. To achieve this, they should migrate from west to east (as lagoon populations do), rather than from west to east and back to west.

So, why do the jellyfish migrate the way they do? Jellyfish Lake, unlike the other lakes, is inhabited by a large population of an important predator of the jellyfish – the medusa eating sea anemone, *Entacmaea medusivora*. In Jellyfish Lake, the direction in which the jellyfish migrate ensures that the edge of the lake, where the anemones lie in wait, will always be in shadow when the jellyfish arrive. The presence of this false edge, and the jellyfishes' avoidance of it, minimizes their contact with the real edge inhabited by their predators. Those jellies that do not respond to the shadowline, get eaten and do not reproduce. Thus, in Jellyfish Lake, the golden jellyfish's unique migration has been shaped by conflicting selection pressures - the need to sun algae versus the need to avoid predators. In the end, it turns out that the medusae can miss a bit of dinner, but not be dinner, and survive.

Is Ongeim'l Tketau's golden jellyfish population considered a different species from its ancestors living in the surrounding ocean?

Jellyfish Lake's golden jellyfish are considered a distinct subspecies of *Mastigias papua*, the common lagoon golden jellyfish. This designation reflects the population's unique migratory pattern and its distinct appearance i.e. its unique adaptations to life in Jellyfish Lake. These heritable differences must be underpinned by genetic differences.

How fast does a golden jellyfish grow?

Best estimates suggest that the bell diameter of a golden jellyfish increases at about 1 cm per week on average. (The bell is the top part of the animal that looks like an umbrella.) At this rate, it takes the average medusa around 2 to 3 months to reach sexually maturity, which corresponds to a bell diameter of about 7 cm. However, some evidence suggests individual may grow more slowly when the population gets quite large, taking many months to reach sexually maturity.

How long does an individual golden jellyfish live?

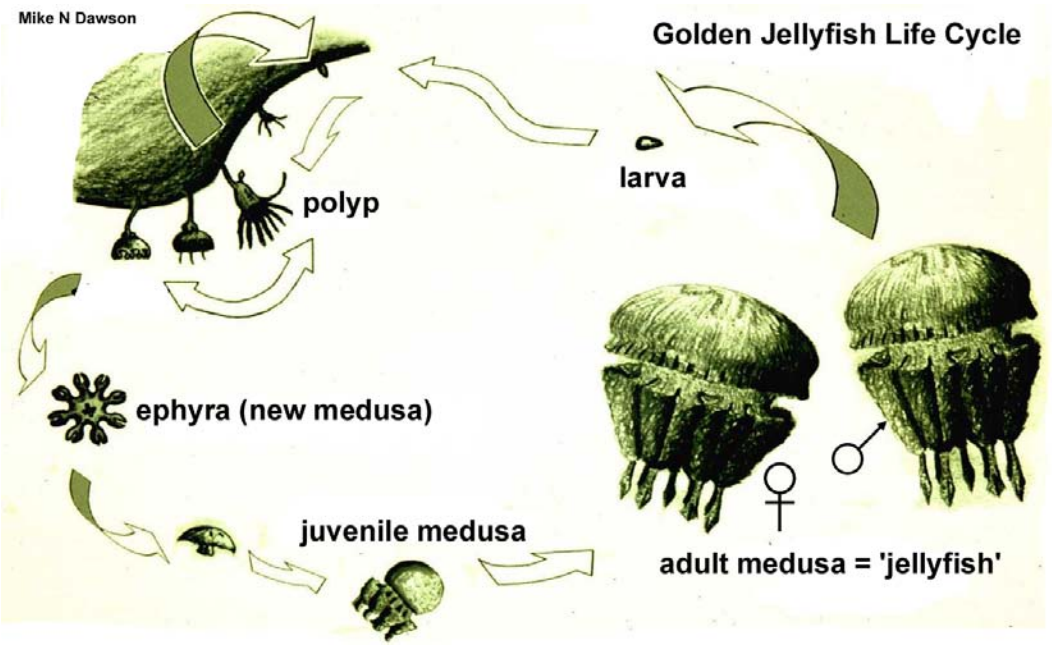
It is difficult to reliably estimate the life span of the average jellyfish in Jellyfish Lake. It seems likely that a given individual lives about 6 months to a year before dying but it could be longer.

Do the golden jellyfish sting? How about the moon jellyfish (Aurelia sp. 4)?

Yes, both the golden and moon jellyfish sting although very mildly. Stinging structures are used to capture small prey. Unlike golden jellies, moon jellies rely completely on their stinging cells, which dot most of their surfaces, to capture sufficient prey to meet their energy needs.

How do the jellyfish reproduce?

The familiar, swimming animal we identify as a jellyfish (properly called a medusa) is actually one of two very different, relatively long-lived life stages that characterize the life cycle of most jellyfish species. The second life stage is the polyp, a minute (only several millimeters in size), free-living animal that looks somewhat like a very small sea anemone - complete with a mouth surrounded by a ring of tentacles situated on the end of a stalk that attaches the animal permanently to its habitat. The medusa and polyp life stages are related to each other in the following way: medusae give rise to polyps and polyps produce new medusae. The transition between one life stage and another occurs cyclically in the following manner.



Like humans, a given medusa is either female or male. Female medusae produce eggs and male medusae sperm. The fertilization of an egg by a sperm produces a small, round, swimming organism called a larva. Upon maturation, which takes several days, the larva locates a suitable habitat on the side of the lake, usually a rock, dead leaf or piece of wood, stops swimming and settles down on it. The larva then undergoes a radical physical change, transforming itself from a round, swimming ball of cells into a sedentary polyp with tentacle-surrounded mouth and supportive stalk. The polyp then lives its entire life attached to that object, using its tentacles to capture small animals from the environment around it.

Polyps are reproductively more flexible than medusae (which can only give rise to polyps via sperm and eggs and the motile larval stage) in that they can produce both new polyps and new medusae. Individual polyps give rise to new polyps by producing a small outgrowth from their body that detaches, swims away, settles on the bottom and quickly grows into a replicate of its parent polyp, complete with all the reproductive abilities of its parent.

Alternatively, under certain conditions, a polyp will produce a new medusa by physically transforming its mouth and tentacle end into a very small medusa (about 2-3mm diameter), which pops off, swims away, and grows into a mature sexually reproductive medusa. The remaining polyp then regrows a mouth and tentacles and lives on with the potential to produce additional medusae and polyps.

Golden jellyfish polyps, note golden color due to mutualistic algae. Lower right hand corner: Polyp producing a new medusa.

How many golden jellyfish inhabit the lake?

The number of medusae varies considerably through time. When the lake was very warm during the La Nina event of 1998-1999, the medusa stage of the golden jellyfish was completely absent. The polyp stage, however, survived this warm period replenishing the lake with medusae when the lake cooled in January 2000. Gradually over the course of about two years, the population recovered to millions of individuals.

In general, the size of the population appears influenced by lake temperature. During cooler periods, such as those observed during El Nino events, the population is generally larger, averaging between 15 and 25 million individuals. During warmer periods, jellyfish abundance can reach lows of 5 to 10 million and during extreme warming events, like that accompanying the 1998-1999 La Nina, can disappear entirely. Monthly updates on the population's size can be found at the Coral Reef Research Foundation's website www.CoralReefResearchFoundation.org/TheLab/Research/Lake/OTMonthly.html as long as they continue to collect these data.

Why are there so many jellyfish in the lake?

Very simply, the lake is fantastic jellyfish habitat with very few factors to limit the production and survival of jellyfish (e.g. few species of predators, abundant habitat for both polyps and medusae, and abundant energy sources in form of sunlight and minute prey). In the absence of negative influences, the life cycle of the jellyfish (see above) is such that millions of reproductively mature medusae produce millions of larva over the course of their lives giving rise to millions of polyps. In turn, these polyps can produce untold numbers of new polyps each with the ability to produce new medusae. Indeed, given the presence of only a single predator the jellyfish-eating sea anemone, *Entacmaea medusivora*, such profligate reproduction is virtually guaranteed.

Do other jellyfish lakes occur in Palau? How about beyond Palau?

Yes, populations of golden jellyfish occur in at least four other lakes in Palau. Each constitutes a unique subspecies. Beyond Palau, golden jellyfish populations are known from marine lakes in the Berau district of Indonesia off East Kalimantan (Borneo) and marine lakes of Ha Long Bay, northern Vietnam. Although genetically very different from those in Palau, individuals in Berau look remarkably similar to those in Palau's jellyfish lakes.

Why does Ongeim'l Tketau lack oxygen and instead contain hydrogen sulfide below 45 feet (15 m)? Does anything live there?

Over thousands of years, the bacteria that break down the dead organisms that sink to the bottom of the lake have consumed all the oxygen and released hydrogen sulfide into the water. In most lakes, oxygen is replenished and hydrogen sulfide removed as oxygen-rich surface waters are mixed down to the bottom by both wind blowing across the surface and tidal action. However, the high ridges around Ongeim'l Tketau greatly reduce the strength of the wind that blows across the surface of the lake and tidal

exchange is limited by the tunnels. This, combined with the relatively deep nature of the lake prevents refreshing surface waters from ever reaching its depths. Now, the only organisms that inhabit the waters below approximately 45 feet (15m) are bacteria that can live without oxygen and both produce and are able to tolerate high concentrations of hydrogen sulfide.

Why is hydrogen sulfide poisonous to humans?

Hydrogen sulfide is poisonous to humans because it prevents the delivery of oxygen to our tissues, which, ultimately, can kill us. Like oxygen, hydrogen sulfide is a gas that is soluble in water. Unlike oxygen, however, hydrogen sulfide can enter our bloodstream directly across our skin. Once in the blood, hydrogen sulfide binds to our hemoglobin (the molecule that binds oxygen and delivers it to tissues throughout our body), which prevents oxygen from doing the same and leads to death by oxygen deprivation (asphyxiation).

Where can I find more information or references on marine lakes?

The Coral Reef Research Foundation website is a good source of information about marine lakes and includes a list of publications.
www.CoralReefResearchFoundation.org.

GOOD PRACTICES: HOW CAN WE ENSURE THE LONG-TERM EXISTENCE OF THE JELLYFISH AND THEIR HOME WHILE ENSURING A PLEASURABLE EXPERIENCE FOR ALL VISITORS?

1. **ALWAYS REMIND YOUR GUESTS NOT TO TAKE ANYTHING BUT *CLEAN* SNORKEL GEAR INTO THE LAKE AND DO NOT TAKE ANYTHING FROM THE LAKE INTO THE OCEAN.** *This includes things that appear dead, like seashells or rocks, which can be home to unnoticed, but potentially invasive, organisms.*

The unintentional introduction of non-native species is probably the biggest threat to the long-term survival of the jellyfish population and, more generally, the ecological health of the lake.

Because Jellyfish Lake is isolated from the surrounding ocean (there is no direct exchange of water), any living organism found in Palau's waters outside of the lake is considered non-native to the lake (even if native to Palau more generally). This includes organisms from other lakes. Thus, all organisms potentially pose a risk to the lake should they be introduced.

The reverse is also true; lake organisms are non-native to Palau's ocean environment. Please do not move anything from the lake to the ocean, or vice versa. Help preserve the separation of Jellyfish Lake and Palau's ocean flora and fauna that originated 10,000 to 12,000 years ago!

Unfortunately, the threat of an exotic species introduction to the lake has already been realized. A non-native sea anemone, tentatively identified as a species of *Aiptasia*, was introduced to the lake sometime in 2003. Since its discovery in late 2003, the sea

anemone population has quickly expanded due to its impressive reproductive abilities. New anemones grow from small bits of tissue broken off of the 'parent'. The ability to reproduce asexually in this fashion highlights the fact that a devastating infestation can result from the unintentional introduction *of just a single individual*.



Ongeim'l Tketau's native sea anemone, Entacmaea medusivora, *(left) and the introduced sea anemone, tentatively identified as Aiptasia* sp. *(right).*

Please help avoid additional and possibly irrevocably harmful introductions by ensuring that your guests do not bring anything but clean snorkel gear into the lake.

2. **PLEASE PROTECT THE FRAGILE JELLYFISH OF BOTH SPECIES FROM MECHANICAL DAMAGE BY HELPING GUESTS PRACTICE CAREFUL SWIMMING TECHNIQUES.** *Lay prone (horizontal) at the surface and propel yourself with slow, gentle motions. Avoid quick actions with both your hands and feet as you can easily snag an animal in your hands, or on your fins or feet, unintentionally tearing or slicing them. If you need to talk to some one lift your head without righting yourself in the water, i.e. don't let your feet project down into the jellyfish. Remain at the surface. Do not free-dive through aggregations of animals.*

Jellyfish are very delicate animals whose bodies are comprised primarily of water (~ 96% of their weight is water) infused throughout a network of tissue. Thus, water provides virtually all of their structural support (it is the equivalent of bones), allowing them to grow large, and appear robust, without any rigid structures. The aqueous nature of these animals leaves them exceedingly vulnerable to damage. Please ensure that animals are not removed from the water, as gravity, pulling on the mass of their waterlogged tissues, will stretch and tear them. This is particularly true of the exceedingly fragile moon jelly. When lifted from the water by hand, these animals literally come apart by dripping through your fingers!

SCUBA diving is forbidden for similar reasons. Exhaled bubbles become trapped inside jellyfish tissue floating the animals to the surface, pinning them there. Unless a human gently tips the animal to release the air, the animals will remain stuck to the surface until the air bubble erodes its way through the tissues. This process results in a hole in the animal leaving it vulnerable to infection and death.

3. **PLEASE DO NOT DISTURB THE BOTTOM OR SIDES OF THE LAKE OR THE ORGANISMS GROWING THERE.**

The absence of strong water currents means the vast majority of organisms in the lake are very loosely attached to the roots, rock, algae, etc. on which they live and can easily be dislodged by even the most careful swimmer. In the case of the introduced sea anemone, dislodgement will assist its spread to unaffected areas of the lake.

Similarly, limited water flow results in the accumulation of large amounts of very light sediment on the bottom. Again, even the most careful swimmer can easily kick up large amounts of sediment, which can resettle to smother organisms.

4. **PLEASE DO NOT APPLY SUNSCREEN DIRECTLY BEFORE ENTERING THE LAKE.** *If possible encourage the use of sun-proof clothing.*

It is possible that sunscreen could accumulate in the lake through time. The ultimate effects of this are unknown. Please advise guests to apply sunscreen at least a half-hour before they enter the lake, providing time for excess material to come off. Encourage them to use waterproof sunscreen. An even better alternative is to encourage them to wear sun-proof clothing instead of sunscreen.

5. **PLEASE HELP YOUR GUESTS ENRICH THEIR EXPERIENCE AND THAT OF OTHERS BY ENCOURAGING THEM TO KEEP THEIR VOICES DOWN ALONG THE TRAIL AND IN THE WATER.**

Quiet visitors are likely to see much more than just jellyfish during their visit to the lake. A variety of birds, including bush warblers, the Nicobar pigeon, biib, fruit dove, fan tails, and the endemic megapode, can be seen along the trail as well as some of the island's tiny reptiles – the delicate blue tailed skink, the larger green tree skink, and the long skinny racer and Palau boa snakes. On rainy days the tiny (6cm long) native frog may be spotted crossing the trail. Even if you don't see it, you will hear it. Often mistaken for calling crickets, this tiny amphibian is the true source of the ubiquitous background chorus of the jungle.

Avian life over and in the lake is also diverse and animated. Spectacular blue collared kingfishers sit stately and still upon mangrove branches extending over the lake, occasionally breaking their trance to call and trace trademark chord-like paths between branches along the shore. Pied cormorants sit silent and motionless on mangrove branches along the edge of the lake, periodically taking to the water to dive for small prey living on the bottom. At times white tailed tropicbirds and fairy terns monopolize the sky over the lake and jungle socializing and intermittently plunging from the sky after the loosely schooled silverside fish that dart among the jellies. Occasionally a large, solitary fruit bat takes to sky above the jungle moving among roosts in the canopy.

6. **PLEASE USE THE FACILITIES LOCATED AT THE TRAIL HEAD.**

7. **PLEASE DO NOT SMOKE ON THE TRAIL OR DOCKS.**

8. **PLEASE MAKE SURE TO TAKE ALL LITTER WITH YOU WHEN YOU LEAVE.**

3.8 Important Marine Life

3.8.1 Marine Algae

The plants of the reef are often not very obvious as they lack roots, stems, leaves and even the green color of terrestrial plants. They can be brown, red or green.

Role of the Reef
As in most ecosystems, plants form the basis of the reef's food chain. Many species of marine algae contribute greatly to the overall structure of the reef. Coralline algae act as the reef's mortar; by secreting limestone, like corals and by growing between coral fragments and rubble, algae helps bind the reef together. Limestone-producing algae also make up a major component of the sand.



Halimeda – is a green algae that produces calcium carbonate or limestone. The remains of the disc-shaped 'leaves' are responsible for over 50% of the coral sand found in many parts of the reef! *Halimeda* can produce limestone very quickly, doubling its weight in as little as two weeks. It has been estimated that *Halimeda* flakes are capable of producing 13cm of reef in less than 1000 years. The brown surface on the reef flat is actually a thin layer of rapidly growing algal turf. This is a primary food source for many of the reefs herbivores like parrotfish, surgeonfish and damselfish, which can be seen feeding in the shallows. If it wasn't for their constant grazing; this algae would quickly grow to form a fuzzy algal layer.
Pat Colin

3.8.2 Sponges

What are sponges?
Sponges are animals that filter water volumes equivalent its own body volume every 4-20 seconds. From giant vase-like structures to obscure creeping forms covering rocks, sponges are important for more than just washing the car!

Their characteristics include:
- ✓ Body covered with tiny openings called pores
- ✓ Food particles are filtered from water
- ✓ Skeletal structure consists of limestone or silica spines called spicules
- ✓ Great range of colors and shapes
- ✓ Attached to the sea floor



Pat Colin

Role on the reef

Most sponges stand out from the reef community with their bright colors and range of shapes. Some of the most important sponges on the reef are those that you cannot see. Boring sponges break down the limestone skeletons of corals and the use the space created as a home. This is one of the major ways that coral is broken down into sand and rubble.

Feeding

If you inspect a sponge closely, you will find its surface is covered in small and large pores. Water is drawn in through the small pores and through a series of canals until it enters feeding chambers where food particles as small as bacteria are digested. Water is expelled from the sponge through the large volcano-like pores. Many sponges contain, like corals, algae that can produce food for them by using light from the sun.

A sponge the size of a cup could filter 5000 liters of water a day!!

Reproduction

Sponges can reproduce asexually by budding and breaking off segments. Most sponges also have both male and female sex organs. During sexual reproduction, eggs are retained by the sponge. Sperm are released into the water and are taken up by other sponges to fertilize their eggs.

Human Use and Impacts

Sponges are being explored for their biomedical properties. Many contain toxins for self-defense and these are being explored for their potential use as drugs for the treatment of various diseases, including cancer. Being filter feeders, sponges can easily become clogged by sand kicked up by divers and snorkelers.

3.8.3 Sharks

A lot of bad publicity (and movies!) have made many people fear sharks. Although some of the sharks encountered on the reef have the potential to be dangerous, most sharks are shy and will not bother divers if they are not fed and are left alone.

Characteristics
- ✓ Skeleton made of cartilage
- ✓ 5-7 gills (usually 5)
- ✓ no swim bladder
- ✓ renewable teeth
- ✓ skin covered with small teeth called denticles
- ✓ have an electrical sense to detect prey

Role on the Reef
Like the lions of the African savanna, sharks play a vital role in the reef system, being top predator. They remove the sick, injured and old and help control animals whose populations are booming. By removing sick or injured animals from the fish populations, mostly the healthiest fish are left to breed; therefore sharks play an important role in maintaining healthy fish population that we depend on for food.

For millions of years, sharks have been top of the food chain, but now this has changed. The removal of millions of sharks each year is upsetting the balance in the oceans.

Types of sharks
Sharks can be divided into two categories:

1. *Bottom-dwellers* – usually found resting on the sea floor. Easily recognized by an opening behind their eye known as a 'spiracle'. Water is pumped in through this opening and out through the gills. (i.e. Leopard shark, Epaulette shark, and the Wobbegong.
2. *Mid-water sharks* – do not possess a spiracle and most rely on a constant flow of water through their mouth and across their gills as they swim. However, some species, such as the white tip reef shark, are able to lie motionless and pump water by opening and closing their mouths.

Senses
Sharks sense of smell is of great importance in sensing prey. Blacktip reef sharks have been found to be able to sense one part grouper in 10 billion parts of water. Sharks also possess a sixth sense. (i.e. the ability to sense minute electric fields generated by all living organisms. This is detected through the small black pores located on the snout of sharks. Sharks can detect voltages as low as a hundred millionth of a volt!

Reproduction
Males can be easily identified by the presence of two-finger like reproductive organs called claspers, located in the pelvic region, on their underside. Females often have mating scars on their backs, from when males grip them with their teeth. The male inserts one of his claspers into the female in order to fertilize her eggs. Most reef sharks give birth to live young, which quickly swim away from the mother when born.



PCS

For each person killed by a shark, over 23 million kg of sharks and rays are killed by people!

Human Use and Impacts
Sharks have been exploited by humans for food and recreation since the earliest days of fishing. As sharks only produce a few young, they are susceptible to over-fishing. Because of this, shark stocks have to be carefully monitored and managed. Evidence of over-fishing is already apparent with the collapses of several shark fisheries and the reduction in numbers all around the world.

Diving with Sharks
Reef sharks are generally very timid animals and tend to stay clear of divers. Three simple rules to remember when diving with sharks are:

1. Don't corner them
2. Don't feed them
3. Don't hang onto them

Whaler sharks, like the gray reef shark, show characteristic behaviors if they feel threatened. They start to swim in an exaggerated, jerky manner, with their back arched and pectoral fins lowered. If provoked, they will turn quickly and chase the intruder. Attacks on divers and snorkelers are extremely rare and in most cases can be attributed to the person spear fishing or feeding sharks.

3.8.4 Manta Rays

The manta ray is the largest of all rays, growing to over seven meters across and weighing over three tons. Like a whale shark, manta rays feed on small fish and plankton. The large flaps on either side of the head are used to direct planktonic food into the mouth where it is filtered out by projections from the gills. These flaps can be rolled up and tucked back when not in use. Manta rays have no barbs on their tails. When diving with manta rays, allow THEM to approach you. Never chase them as they will swim away and may not return to the same spot next time.

3.8.5 Sea Snakes and Sea Kraits

Although similar to land snakes, sea snakes are well adapted to the marine environment. They have a paddle-shaped tail that propels them through the water, and their belly scales are formed into a keel that helps stabilize them when they are swimming.
The species most commonly encountered here is the banded sea krait, *Laticauda colubrina*.

Feeding
Sea kraits like sea snakes are among the most venomous snakes in the world possessing some of the most potent toxins known. Most feed on a variety of fish, with one species, the turtle-headed sea snake, being specialized in feeding on fish eggs.

Defense
Sea snakes are not aggressive, except during the mating season, when they are territorial. Fortunately, the fangs of the sea snakes are quite short, with only the large animals able to penetrate a wetsuit. In addition, sea snakes also have the ability to withhold venom during a strike. The Palauan sea krait is not aggressive. There are no reports of injury from a sea krait.

Reproduction
Externally, the female Palauan sea kraits are larger than males. Sea snakes may produce between two and ten live young, which are born at sea.

Diving
Sea snakes are great divers, being able to dive for over an hour. They only have one lung which is over two-thirds of their body length. In addition to breathing air, sea snakes are able to take in about 30% of their oxygen requirement from the water through their anus and skin. By taking in the extra oxygen they are able to displace the amount of nitrogen in their blood, which prevents suffering from the bends.

Information Source: Great Barrier Reef Marine Park Authority REEF MANUAL: Understanding Essentials of Communication 1999.
Mandy T. Etpison, 2004. Palau-Natural History.

3.8.6 Fish

Nearly 1300 species of reef fish are found in Palau. Large schools of reef fish aggregate on the reefs for protection, feeding, and breeding. Schooling protects fish from larger predatory species as it is difficult to target one fish when there are many. Reef fish feed in schools at specific areas rich in benthic, pelagic, and planktonic food, such as dropoffs, channels, seagrass beds, and even corals serve as food for some fish like parrotfish and butterfly fish. Reef fish are herbivores, carnivores, and omnivores with specific food requirements in specific habitats. Reef fish aggregate at certain times and locations to breed. This could be due to the physical characteristics of an area such as the presence of offshore currents that enable fertilized eggs to disperse away from areas with many predators. It is very important not to harass or feed fish that are in schools as it disrupts their natural life cycles of feeding and breeding and threatens their very survival. Fed fish are easy targets because they become conditioned to being fed and do not seek shelter when approached by fishermen.

3.8.7 Turtles

Two species of turtles are commonly encountered in Palau and use the beaches here for nesting, the Green turtle and the Hawksbill turtle. However, Olive Ridleys, Leatherbacks and Loggerhead turtles occasionally pass through Palau's waters.

Green turtle
The green turtle is the most commonly encountered species. Adults have a smooth, high-domed carapace (shell) that is green in color with brown, reddish-brown or black highlights and a white underside. Green turtles feed mainly upon seagrasses and algae and can grow as large as 47 inches long and weigh 400 pounds. They can live to be as old as humans but have to wait 20-35 years to lay their first eggs. Nesting occurs in low numbers throughout Palau but more nests are mainly in the South West Islands with some nesting in Kayangel and other areas of Palau.

Hawksbill Turtle
The hawksbill turtle nest mainly within the Rock Islands. They grow to about 37 inches and weigh 145 pounds, surviving on a diet of mainly upon sponges as well as jellyfish, shrimp, etc. The Hawksbill is valued for its thick shell, used in Palau for *toluk*, women's money and for jewelry, such as earrings and necklaces.



Pat Colin

Human Impacts

Turtle populations have declined dramatically throughout the world and all turtles are listed as 'Endangered' by the World Conservation Union. In Palau, it has been estimated that there are only about 125 Green female turtles nesting on beaches and only about 20 Hawksbill turtles! Turtles are still killed for food and without a moratorium (a ban) on turtle meat in coming years; it is likely that they will become extinct.

Turtles are valued by the dive industry. If you see a turtle underwater, keep your distance and do not chase it.

Information Source: Palau Conservation Society Turtle Fact Sheet

3.8.8 Dugongs

Palau is the only country in Micronesia and one of the few archipelagoes in the world that still has a population of dugongs. Dugongs, or sea cows, are marine mammals similar to manatees and are herbivores, feeding on sea grasses that grow in the waters around the islands. The population here is endangered, having experienced many years of poaching. If you see a dugong out on the water, you are extremely lucky as they are shy animals that only come up to the surface to breathe and usually move away from boats. Female dugongs give birth to calves every 5-7 years and the calf will stay with the mother, suckling her milk, for up to 1.5 years.

Be careful when driving boats in shallow waters as you could hit one of these slow-moving animals and endanger its life. If you are lucky enough to see a dugong, turn off your boat engine and wait –they have to surface to breathe every couple of minutes, so you may have a chance to watch its behavior for a while. Call Palau Conservation Society and provide them with details of your encounter.



Daryl Doming

3.8.9 Palau Conservation Society's Incidental Sighting Program

Palau Conservation Society is collecting information about dugongs, turtles and crocodiles. You could help collect valuable information that will enable us to conserve these beautiful animals for the future generations to enjoy. Please call or visit Palau Conservation Society (488-3993) and collect some Incidental Reporting Cards, which you can keep on your boat or at your shop and fill them out when you encounter these animals.

Sources for Additional Reading:

There are a number of marine life identification guides available from most dive shops and the Etpison Museum. Other books describing the marine life of Palau include:

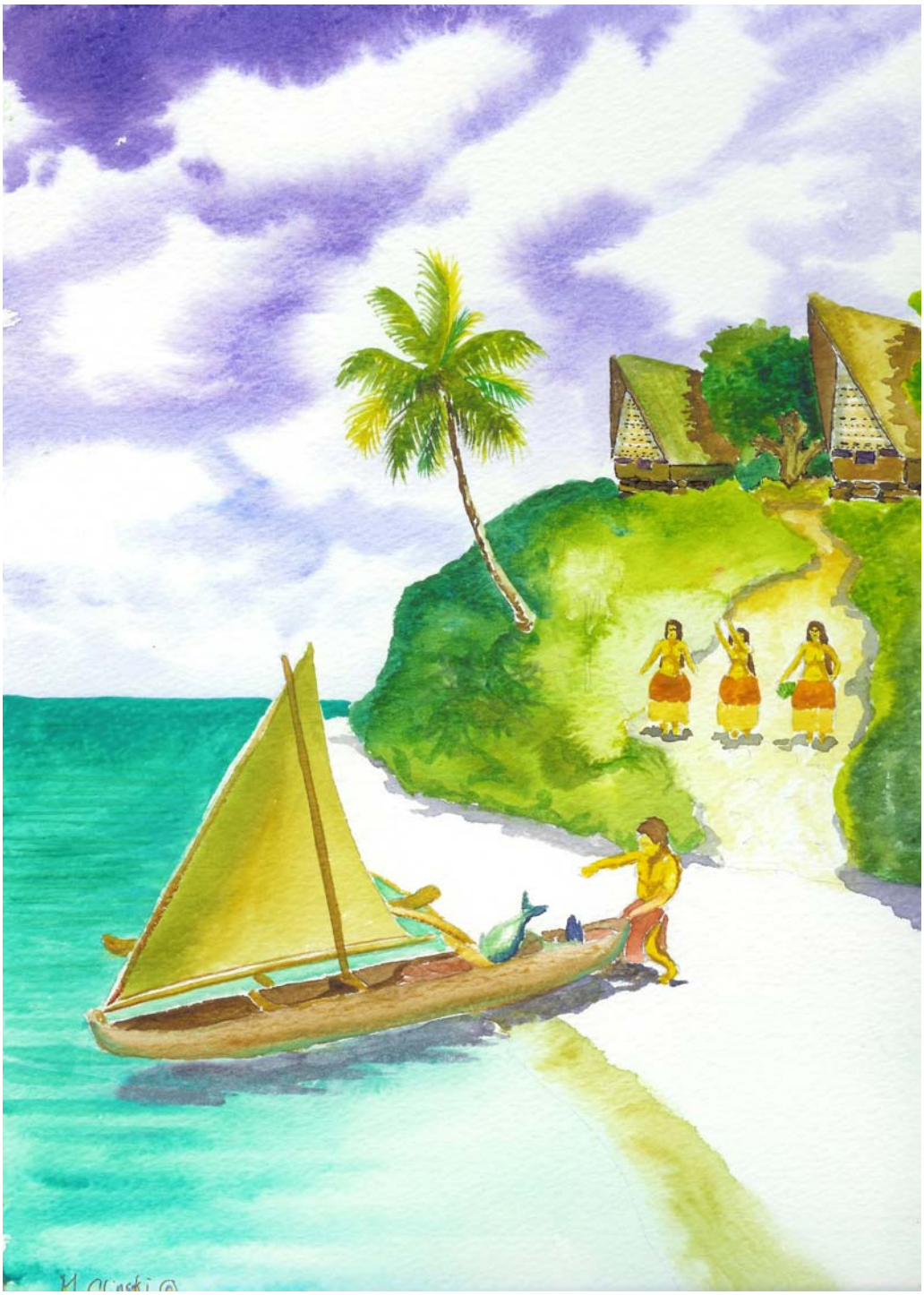
Pat Colin and C.Arneson. 1995. Tropical Pacific Invertebrates.
Gunther Deichmann, K. Davidson, E. Daniels, and G. Taus. 2001. Palau.
Mandy T. Etpison. 2004. Palau - Natural History.
Ann Kitalong. 2002. A Personal Tour of Palau.
Bill Perryclear. The Rock Islands of Palau.

Internet Resources regarding coral reefs and other marine environment related information:

Organization and focus	Websites
Reef Check Up=plan for preserving and restoring coral reefs	www.reefcheck.org
Climate Change=filling reports to help scientists understand coral bleaching	www.reefbase.org/input/bleachingreport
Blue Ocean Institute=focuses on deepening connection between humanity and living seas.	blueoceaninstitute.org
Blue Voice=documents transgressions against marine life on film.	www.bluevoice.org
Conservation International=applies science, economics, policy and community participation to protect ecosystems.	www.conservation.org
Coral Reef Alliance=works with global communities around the world, helping to solve coral reef conservation challenges.	www.coral.org
The Cousteau Society=dedicated to preservation of nature for future generations.	www.cousteau.org
Earth Island Institute=serves as an incubator and support network for more than 30 conservation and restoration projects.	www.earthisland.org
Environmental Defense=links science, economics, and law in environmental advocacy.	www.environmentaldefense.org
Greenpeace=uses nonviolent confrontation to expose environmental problems and to force solutions.	www.greenpeace.org
Marine Conservation Biology Institute=works to protect and restore marine life.	www.mcbi.org
Marine Fish Conservation Network=lobbies government officials in support of marine conservation legislation.	www.conservefish.org
Monterey Bay Aquarium=coordinates marine conservation and research programs.	www.mbayaq.org
National Coalition For Marine Conservation=works to conserve the world's ocean fish.	www.savethefish.org
National Environment Trust's Conserve Our Ocean Legacy Campaign=is a broad national effort to build support for ocean and fish protection.	www.oceanlegacy.org
Natural Resources Defense Council=uses law, science and activism to protect the planet's wildlife and wild places.	www.nrdc.org
The Nature Conservancy=works to protect more than 117 million acres around the world.	www.nature.org
New England Aquarium=provides leadership for the preservation and sustainable use of aquatic resources.	www.neaq.org
Mooring Buoy Installation & Maintenance Guide	www.coralreefalliance.org/divein/eventideas/mooringbuoys.html

Organization and focus	Websites
Oceana=works to restore and protect the world's oceans through policy advocacy, science, law and public education.	www.oceana.org
The Ocean Conservancy=seeks to inform, inspire and empower through science-based advocacy, research and public education.	www.oceanconservancy.org
The Ocean Project=works to promote ocean conservation through zoos, aquariums and museums.	www.oceanproject.org
Reef Environmental Education Foundation=seeks to educate and enlist divers in the conservation of marine habitats.	www.reef.org
Reef Guardian International=works to protect coral reefs and their marine life	www.reefguardian.org
Reef Relief=works to preserve and protect living coral reef ecosystems.	www.reefrelief.org
Seacology=works to preserve the environments and cultures of islands.	www.seacology.org
Seaweb=works to link the media to marine conservation groups.	www.seaweb.org
World Wildlife Fund=works to save endangered species and wild places.	www.wwf.org

Chapter 4: Traditional and Contemporary Culture



This section covers a few aspects of Palauan culture, including an outline of cultural sites in Koror.

4.1 Traditional Society

According to archaeological evidence, by AD1200, most of the people had left their homes in the Rock Islands and moved to the bigger islands of Babeldaob, Oreor and Ngemelachel. They had a well-established Palauan society with emphasis on a matrilineal clan system, closely tied to reciprocity and competition. In the early days, each village had its political structure consisting of a council of chiefs and the various dual clan organizations. Prior to contact with foreigners, different villages started increasing their influence and power by forming alliances and through warfare. Two villages that eventually became powerful were Melekeok in Babeldaob (high waters) and Oreor in Iouldaob (low waters). Alliances under these two villages headed by the Reklai of Melekeok and the Ibedul of Oreor consisted of loose, fluctuating federations.



PVA

The female chiefs were; and still are, responsible for the selection of the male chiefs from a group of potential candidates. The women were responsible for awarding titles and the titles bore the authorities and responsibilities of the position. When a title holder died, the title reverted back to the women who would then pass it on to a qualified member of a chiefly line. The recipients were normally from the matrilineal line.
The male chiefs determined issues such as warfare, fishing and construction of the bai.
The ranking women had authoritative roles in agriculture, marriage, birth, death and funerals, and food preparation. This is in addition to the role of the high-ranking women in conferring chiefly titles on the men.

In general, there were 7-10 clans which were ranked from the highest to the lowest in each village. When the chiefs met, they sat in order with the highest-title holder of the highest clan acting as the leader of the village council.

A village might have more than one club; one for young men, one for middle-aged men and one for old men. These clubs would compete with each other in carrying out the

tasks assigned by the village council. Tasks included cleaning the village, thatching the roofs and fishing.



PVA



PVA

For women, one very important ceremony was for the celebration of a successful childbirth. Delivering the first child was a risky experience; many young women died in childbirth. These special celebrations were for the new mother if she lived through this important natural process. This ceremony, the ngasech, is still held today, although the chances for survival by mothers have greatly improved due to modern health practices.

Information Source: Natural History of Palau

4.2 Palauan Money

Udoud
According to legends, some form of Palauan money (*udoud*) may have been in existence in Palauan culture since ancient times. Some researchers believe that Palauan money came from Yap, while others think it is more likely to have come from South East Asia or China. Ornamental beads brought in as recently as the nineteenth century have since been included in the Palauan money system. Nowadays, imitation as well as authentic Palauan money is observed being worn around the neck by some women and children. In the past, only high-ranking women wore Palauan money necklaces, since Palauan money was owned mostly by high-ranking families.



PVA

Toluk
There is another type of money made of hawksbill turtle shell that is used only by women. This particular valuable is called *toluk* and is used mainly as an exchange for service. It may be accompanied by *udoud* if a particular circumstance requires both. In ancient times, a certain type of seashell (*chesiuch*) was used as money. The *toluk* eventually replaced this money.

Some of the important events in a person's life or in village functions in which Palauan money was and is still used are in ceremonies or transactions pertaining to birth, marriage, house-building, divorce, adultery, *mur* (elaborate feasts), dance presentations, women's services, penalties, magic, death, inheritance, war and head-hunting and installation of chiefs. Pictures depicting Palauan money and the legends surrounding it are frequently painted on the rafters of the bai.

4.3 Canoes

Canoes were a very important part of the culture in Palau. There were four types of regular vessels: sailing canoes, war canoes, cargo canoes, and ocean-going canoes. These canoes were very well built and even heavily decorated, such as the paddling war canoes, which could sometimes reach up to 40ft and could carry up to 30 people.
Canoes can be viewed in several states including Koror, Melekeok, and Ngchesar.

4.4 Food

The food of early Palau were basic and nutritious. They consisted mainly of taro and certain types of fruits and vegetables. For protein, there was an abundance of fish and other seafood, pigeons and another bird resembling a small chicken (its eggs were eaten, but not the bird). Breadfruit was rare and seldom eaten. Dishes prepared with coconut juice, milk and coconut meat were common.



PVA

Food was not only used for nutrition but also a source of pride. Customarily, when a clan sponsors a feast; there is more food than can be consumed by the guests. At the end of the feast, the host plans to give food baskets to those who traveled far as sustenance for their journey home. This practice continues today as a good host respects the guests' participation in the celebration.

Food has always been and still is, one of the most significant elements in Palauan community events such as marriages, funerals, paying for a house, and every other occasion of importance when people congregate. This is a tradition that goes back to the earliest days of Palauan history.

4.5 Rock Island Art and Historical Importance

The southern Rock Islands are considered to be the location of the earliest settlements in Palau. The expanding population later moved north, where agriculture was easier on the flatter more fertile lands of Babeldaob.

On top of the Rock Islands, remains of ancient stone pathways and village sites can be found overgrown with dense jungle. Pathways can be seen about 40ft above the waterline on many of the island cliffs. Some believe these are the eroded remains of previous wave undercuts before the sea level dropped to present levels. Several of the pathways are flat, over 6ft wide and give the impression of being man-made. Most are overgrown and difficult to see, but some can be seen from boats.

Caves are often hidden along these paths, with pottery shards or human remains evident. These areas were obviously inhabited by people centuries ago, and cannot be confused with caves where Japanese soldiers fought during WWII. The Japanese caves are along the waterline, some with metal gun shells or pieces of guns evident. Also, almost all Japanese pottery was glazed, while the old Palauan pottery shards are unglazed and primitive.

Hundreds of pictographs can be found on the cave walls and along the pathways of the Rock Islands. The same yellow and red paints are used although stylistically, every site is different.

On Ulong Island, one of the largest collections of pictographs can be found. The drawings here are of a symbolic design, more impressionistic than others found so far. The designs almost seem to be stenciled onto the rocks.

Another site, called White Cliff, is close to the Lighthouse Channel in Koror. One can easily see the red paintings on the pathway from a boat. The pictographs here clearly show human figures, hand prints and canoes, and are of a very different style. At both sites, caves can be found behind the pathways, containing pottery shards and some human bones. One of the caves at Ulong has a cooking pit inside it with shell tools and pictographs evident deep inside the cave. The pictures inside are badly eroded due to moisture.

Pictographs have been found on 8 different islands and many more may exist hidden behind vegetation. This rock art shows no resemblance to any known rock art in Micronesia and has not been dated. Palauans were only familiar with the rock art at Ulong and explained it as being the work of the god called Orachel. Orachel was practicing his painting on these rocks before going up north to show the Palauans how to decorate their meeting houses with paint.

4.5.1 Ulong Island



Captain Henry Wilson

Palau's history is marked by the arrival of the English ship Antelope, because for the first time a detailed account of its people's way of life was documented. Captain Henry Wilson wrecked on August 10, 1783, when the Antelope ran aground on the reef west of Ulong. Captain Wilson and his crew came to the island of Ulong and set up camp. The Chief of Koror, Ibedul, and its people aided the Captain in rebuilding his damaged ship. In exchange, Captain Wilson provided Chief Ibedul with modern firearms that were used in battles between Koror and enemies in Babeldaob The military and technology support given by Captain Wilson to the Ibedul helped strengthen Koror's power over its rivals in the north.

After the completion of his ship, Captain Wilson agreed to take the Chief Ibedul's son, Lebuu, to England. He believed that if this young man could be educated in England, he would someday return to his people and be able to educate them. Unfortunately, six months after his arrival in England, Lebuu became ill from small pox and died. He was buried in England in Captain Wilson's family graveyard. Captain Wilson returned several years later to Palau, bringing gifts such as sheep, goats and pigs to the High Chief Ibedul.

This remarkable story was recorded by George Keate, who was a member of the Antelope crew. Keate's "Account of the Pelew Islands" recorded an amazing number of details on life in Palau including what people ate, how they obtained their food, social relations, status, and political relations. The wreck of the Antelope at the reefs of Ulong Island marked the beginning of European intervention in Palauan affairs, initiated the beginning of two centuries of colonial domination of the islands, and lead to the first Palauan to seek a Western education abroad.



Prince Lebuu



Ulong (today)

4.6 Stone Monoliths

Stone carvings are found all over Palau, mostly on Babeldaob and Koror. Some were used in religious rituals, while the purpose of others is unexplained. Stone pathways, sitting stones and platforms of houses and villages can still be found almost intact around the islands. Stone monoliths and free standing carvings can be seen along the road of Melekeok State. Some of these carvings are 10ft tall.

These stone faces called *Klidm* by locals are found in many different styles. However, know that stone faces are all each different and may be called differently from State to State. Some have fearsome, aggressive faces with large sunken eyes and fanged mouths. Others are more realistic, with fully formed features and an outline of a head, like the one found in Ngerbodel village, Koror.



PVA

None of the stone faces have been dated and it is unclear who made them or for what purpose. Local legends tell of gods or spirits who made them, or that they were people who were turned to stone by gods. The stone type they are made from is not long-lasting and algae growth makes the features disappear over the years

Another well-known stone carving is located in Ngermid, Koror, known as *Bad er a Ngermelei*. Local legends say that it represents a mother and child turned to stone, others say it shows a stone face with fanged teeth and sunken eyes, and a smaller face carved on its head. These particular stone carvings in Koror, mentioned above are not established visitor/tourist sites, please be mindful and respectful as they are located in residential areas.

4.7 Religion and Magic

Since pre-contact times, the Palauan faith was based on ancestral worship and nature Spirits. The ancestral Spirits were called *Bladek*, the nature spirits *Chelid*. After death and burial it was believed that the spirit moved to a resting place. One such resting place was a flat topped Rock Island called Ongetekatel. Another is Ngedelock, on the southern tip of Angaur Island. There spirits were often heard singing and priests went there to communicate with the spirits.

Priests were called '*Kerong*'. They were not appointed but became priests after the spirits 'called' them. They would then announce their priesthood. They were usually from low-ranking clans and rich clan members would come to them with offerings and money for the spirits. The priests answered their questions and requests on behalf of the spirits, and were said to be able to conjure up illness, death or spells. Priests often became rich from these offerings and received money beads that would otherwise have stayed in rich clans only.

Special houses were built for the priests and spirits, called *Ulengang*. These small houses were often as well decorated as the most important village meeting house.
Spirits could have representatives in the forms of animals or village Chiefs. Some chiefs were considered to be half-man half-god.

Besides priests, there were also magicians in Palau, called *Rekerong*. They were not as powerful as the priests but could conjure up spells. Not protected by the spirits, magicians were often killed if suspected of putting a curse on someone. Magicians worked with leaves, betelnut, and other objects and made leaves dance, kids disappear temporarily and made love potions.

Although the Spanish, Germans and early traders tried to convert the Palauans to Christianity, many only followed out of fear. Even when converted, they often stuck with the local faith. In 1915, the Modekngei movement was founded on Babeldaob. The movement was based on the original faith in offerings and spirits and still exists today, although now it has mixed with Christianity in many ways.

Missionaries have been successful though and most Palauans are Catholic, Protestant or Seventh Day Adventist. Bahai, Mormon and other religions are also present. The spirit houses have all but disappeared. Most were damaged during storms and families who converted to Christianity never bothered to have them rebuilt. The Modekngei people have started using modern buildings for their meetings.

4.8 Bai

A traditional Palauan meeting house is called a *bai*. Every village used to have several, and these wooden structures were unique masterpieces of architecture considering the builders used primitive tools. Similar buildings have been found in Malaysia and Indonesia, but the Palauan bai differs in that no metal was used at all: no nails, screws or pegs. Even their main tool, the adze (*Chebakl)* had a blade made from shell, while the Malaysian and Indonesian areas had metal available centuries earlier.

The decorations on the Palauan bai were much more elaborate. The Palauan bai structures were probably at their best during European contacts. The quality and craftsmanship diminished in later years and many were destroyed during storms and local wars. Around 1900, many villages and bai were not rebuilt due to the dramatic drop in population at that time. The bai decorations told stories from all the districts of Palau, thus preserving historical events and legends since there was no other written history. It is not known when the first bai was built in Palau. It probably started with the first inhabitants of the islands. The wooden structures lasted around 50 years, until weakened by storms and termites, when they were rebuilt again.



PVA

A *bai* is a large structure around 80 feet long, 20 feet wide and 40 feet high. It was built on a stone platform, constructed of round andesite stones. Sometimes there were two or three bai next to each other. The inside of a bai basically consists of a large rectangular room with two fireplaces in the hardwood floor.

There were two types of bai, the bai ra Rubak and the bai ra Cheldebechel (the bai for Chiefs and the Clubhouse bai). The bai ra Rubak were more elaborately decorated than the others and women were not allowed in these bai. The clubhouse bai were like schools where youngsters were taught about fishing, hunting and carpentry. Often the first sexual experience for a young man was in this bai. Young girls from other villages were brought in for these services and Palauan money beads were exchanged in return.

The village that wanted a bai would purchase a prefabricated one from the men's club of a nearby village. After the bai was moved to the site, the purchasing village would complete the roof and floor.

The master builder of a bai was called the *Dach el bai*. He was usually an older man with much building experience. The ability to please spirits made him a sort of religious figure

also. The decorations on the bai determined the quality and value of the building and how much the village was going to pay the master and his crew.

Three different types of wood are used for the construction. The floor was made of dort (*Intsia bijuga*), a hardwood from the limestone islands, while the beams were made from ukall (*Serianthes grandiflora*); a large and easily worked tree found on Babeldaob. *Mekekad* (*Lumnitzera littorea*) is found in the mangroves and used for parts of the bai.

Both the insides and outsides of a bai were decorated with stories and motifs from all over Palau, telling of wars, natural phenomena, spirits and family relations between clans and villages. The stone platform on which the bai was built had four upright stones which served as back rests for the highest ranking Chiefs, who called the meetings. The four corner posts of the Bai usually represented the leading clans of a village, whose chiefs governed the village.

4.8.1 Museum Bai of Koror

In 1969, the Belau National Museum tried to revive this unique part of Palauan history by rebuilding a bai in the traditional way. It was built in about eight months' time using traditional tools and materials. Master builder Ngiracheliong Ngirasibong was helped by two men's clubs from Ngaremlengui and a club from Ngarchelong. The project was sponsored by the Palau Legislature and the Trust Territory Government. The newly-built Bai was first damaged by a typhoon, and then burned down by unknown persons in October 1979.

For decades after World War II, Koror did not have a bai since all of them had been destroyed. Koror used to have one of the famous bai located in Ngermid village. Throughout the years, most important foreigners who visited Palau stayed at this bai, including Kubary, McCluer, Wilson and Cheyne, who all had important roles in Palau's history.

In 1990, another bai was rebuilt at the same site and can be seen there today. The quality of the decorations and paints used does not seem as good as those used for the traditional bai (which often lasted for decades), and repainting has had to be done already since its construction.

4.9 Yapese Stone Money

The Yapese people had been coming to Palau for centuries to carve their unique stone discs out of limestone cliffs before the traders started visiting Micronesia. Exchanging favors with the Palauan chiefs, they were allowed to quarry certain cliffs around Koror and Airai State. Not having any metal tools, the discs were carved with clamshells and stone tools and adzes. Discs were up to four feet in diameter, the maximum size they were able to carry and load on their canoes to bring back to Yap. The size and hardship in carving and bringing it back to Yap determined the value of the piece.

After the trader O'Keefe shipwrecked on Yap in 1871, he decided to stay and bought a Chinese junk, starting operation in 1875. He got the Yapese to work for him and collect copra as payment for transporting their stone money discs from Palau to Yap. He also

traded metal tools with them, and the Yapese were then able to make larger stone discs than ever before.

Carving and transporting the discs by sea was no longer a problem, but hauling the stones from the quarries to the boat was still difficult and lots of pieces broke on the way or rolled into the sea.



Apparently the Yapese used to stop in Ngkeklau on their way back to Yap when they were still bringing the stones by canoe before 1875. In 1994, a Palauan family who were building a house near the beach found fourteen intact pieces of stone money on their property, ranging from 8 inches to two feet in diameter, which may have been a storage place for the Yapese. Other stone discs have been dug up in other areas in Palau and a few large, unfinished pieces are still near the original quarry sites.

Like the Palauan money beads, the Yapese discs were exchanged between families during traditional customs and used to purchase land on Yap. Yap has limited limestone ridges, which is why they traveled to Palau to get these discs. The holes in the middle made it easier to carry them down to the canoes.

You can see a huge piece of Yapese stone money on small Rock Island adjacent to Airai State. It was discovered along with unfinished pieces, metal tools and a living and burial site by Americans who were recently in Palau searching for WWII artifacts.

Information Source: Palau- Cultural History 2004. Mandy T. Etpison.

Sources & Additional Reading

The Bureau of Arts & Culture has produced a series of booklets describing different aspects of traditional Palauan culture. These are available for a small price (around $3) from the Belau National Museum. Books are also available on most subjects described as well as many more, from the Belau National Museum and the Etpison Museum.

Chapter 5: Palauan History



5.1 Historical Periods

The history of Palau can be divided into four main sections:

1. Time of Gods
2. Pre-contact (before 1783)
3. Contact (1783-1888)
4. Modern (1888- present)

Time of the Gods

- Beluu ra Imeungs – one of the most well-preserved and important archaeological sites in Palau. Imeungs was the eldest son of Milad, the god who recreated Palau following the great flood. Imeungs represents one of the four corner posts of traditional Palauan society.
- Medechii Belau – originated in Ngatpang and came to Airai
- Odalmelech – stone faces of Melekeok. Odalmelech was the god of Ngermeled.

Pre-Contact Times

- Ancient Rock Island villages, caves, pictographs, traditional village sites and remains of traditional culture.
- Badrulchau – one of the most impressive archaeological sites in Palau. It covers an area of five acres (4 hectares). Pre-historic terraces exist between Ollei and Mengellang villages in Ngarchelong. There are 37 monoliths (large upright stones) set into two major rows. The monoliths were dated back to 90-1165AD. There are many stories about how the monoliths came to be there. One example is the story about the gods who constructed the pillars or the Portuguese built the structure.
- Ulong Island – an old village where you can find pieces of ceramic pottery, shell middens and burial sites as well as pictographs in the caves.

Contact Times

- Ulong Island is also the site where Captain Wilson was shipwrecked in 1783 and where the people of Koror assisted him in building a new ship.

Modern Times

- Consists mainly of remnants of intense battles between the Japanese and Americans during World War II. The southern islands of Peleliu and Angaur are the areas where most artifacts remain. Shipwrecks are concentrated around Malakal Harbor, but found throughout Palau.
- The *Zero* fighter plane can also be seen adjacent to Ngeremdiu beach.

Information Source: The Environment, Inc. 1994 Tour Guide Handbook

5.1.1 Pre-Contact Times

Caroline Islanders are thought to have originated in Southeast Asia, and Malaysia, probably inhabiting the area in about 1000BC. In Palau, there was ongoing political rivalry between two main village groupings, (now Koror and Melekeok), and archaeological evidence confirms the existence of highly specialized shell and stone technology and extensive agricultural terracing. See Culture section for information on traditional society in these times.



PVA

5.1.2 Contact Times

The first European visitors were Spanish, in 1710 and 1712 and they called the islands Los Palos. In 1783, the wreck of the British ship, *Antelope*, led to the introduction of the chief of Koror's son, Lebuu, to London society.

European ships made a number of later contacts and some mapping of the islands was conducted by the French explorer, Duperrey in 1824 and a Russian expedition in 1828. Spain attempted to retain its sovereignty over the region, but it was challenged by the Germans and the British. Finally, the Germans purchased the Carolines from Spain in 1898 and although its commercial interests in Palau lay in the possibilities of plantations and phosphate, the German colonial administration was responsible for introducing health regulations to control epidemics that had hugely ravaged the populations since first European contact.

5.1.3 Modern Times

At the start of the First World War, Japan took over the Carolines in 1914. As a Japanese colony until World War II, Palau attained a modern infrastructure including harbors, roads, bridges, sewage systems, and electricity – along with expansion of the copra industry and phosphate production. Japanese military authority was replaced in 1922 by the civilian South Seas Bureau, and the administrative center of Koror had a population of 25,000 Japanese (four times the local population) in 1935. Then Japan began to build up its military forces in the Pacific, setting up fortifications in the Carolines and making them a closed military area in 1938.



PVA

After Japan entered the war, Palau became a base from which to enter the Philippines. Micronesia remained under US military control for two years after the war ended. Palau became part of the US-administered UN Trust Territory of the Pacific Islands (TTPI) in 1947 and was the last of four political entities that emerged from the now defunct TTPI. A nuclear-free constitution was adopted on January 1, 1981, but this long delayed a mutually acceptable Compact of Free Association because it was seen as incompatible with the US perceptions of its defense interests. The compact agreement between Palau and the United States in 1986 gave the islands independence subject to defense being the responsibility of the United States for 50 years. Successive referenda in Palau, however, failed to produce a 75% majority. In 1987, Palau voted to amend the Constitution to allow approval of the compact by a simple majority. In a subsequent plebiscite, 73% of the votes were cast for the compact, but the Palau Supreme Court ruled this invalid in August 1988. The courts also ruled there were inconsistencies between the compact and Palau's nuclear-free constitution, which was incompatible with the US defense policy, an impasse which was broken when Palau revised its constitution. Agreements with the Bush Administration in 1989 provided assistance in paying off foreign debt and funds for new development. The Belau people remained citizens of TTPI. On November 9, 1993, a 68% majority voted in favor of the compact. After this vote, Palau achieved self-government on 1 October 1994.

President Haruo Remeliik, who had strong anti-nuclear convictions, was assassinated in July 1985. His successor, President Lazarus Salii, died from gunshot wounds in mysterious circumstances, although it is widely accepted that he committed suicide.
Salii was followed in office by Ngiratkel Etpison. Following him, Kuniwo Nakamura, a former teacher elected in October 1992, managed the country's change of status, achieving an agreement by the United States to pay Palau compensation over 15 years for military control and for over 50 years for political control rights. Palau received $450 million for the first year. The following president was Tommy Remengesau Sr., who was followed in office by his son, the current president, Tommy Remengesau Jr.

Information Source: Political History (from The Pacific Islands: An Encyclopedia)

5.2 Historical and Cultural Sites in the Rock Islands

Site Name	Island Location	Other WWII, German, Japan, U.S	Settlement	Burial Site	Rock Art	Comments
Ngerengchol	Ulebsechel Island		•			Settlement estimated between A.D 1300-1400. Large population/settlement remains found there suggests the overuse of resources that may have caused the abandonment of the settlement along with constant warfare. (Source: Masse, 1984).
Ngermid Ichum	Ngermid dock	•	•		•	The only rock painting located at a site that still has people residing in the area, near Mechang at Ngermid.
Taberrakl Cliffs adjacent. to Ngederrak Reef.	Ngeruktabel				•	Located on southeastern coast of the island. Contains the most number of pictographs. Many are handprints. Pictographs resemble some found on Olechukl lars, at Ulong. Pictographs are located on the wall and ceiling of a Cliff Ledge (Source: McKnight 1964;11-21)
Metukeruikull	Ngeruktabel		•			Remains of a heavily damaged stone platform can be found on the beach. Remains of pottery sherds and 8 stone platforms were found there. A small area but evidence suggests that a large population resided there (Source: Masse and Synder, 1982)
Ngeremdiu (Ancient village called Oimaderuul)	Ngeruktabel	•	•			Inhabitants of this settlement were believed to have moved to Melekeok (Source: Osborne). Secharuleong who controlled Melekeok before Reklai, supposedly came from this village. Old Japanese Lighthouse foundations and limestone dock remains. The Germans used this same area previously as radio/light house. The trail and dock are still in relative good shape, but is covered with dense limestone vegetation.
Skogi Japanese Zero	Uchul a Chei	•				A Japanese fighter plane shot down in WWII. Most of the plane remains in tact. Located on the reef area of Uchul a Chei closest to towards the island (Kisakes beach).
Ngchus	Ngeruktabel	•	•			The Japanese used to raise Pearl Oysters (Chesiuech). Old building foundations and remains of dock are still there.
Site Name	**Island Location**	**Other WWII, German, Japan, U.S**	**Settlement**	**Burial Site**	**Rock Art**	**Comments**
Burial cave	Chomedokl				•	Ancient burial site. Unfortunately, it is very difficult to find any remains. At one time many bones and skeletons could be found in this cave.
Olechukl lars	Ulong		•		•	2nd greatest number of pictographs Ulong island is associated with legend of Osilek (first rubak of Ulong) and Oreng. The pictographs are placed over the back wall and roof of a cave on a limestone cliff that is located at the northwestern end of the island. In a room in the back of the cave, a bowl-like depression lined with

						bright red earth which, like a similar depression found at Taberrakl, is believed to have been used for mixing paint. (Osborne 1966)
Ngerechong	Ngerechong	•	•			Inhabitants helped Koror's noblemen to avenge Ibedul's death. Building remains are found there possible from the Japanese time.

Most of the sites mentioned above are known sites of historical and cultural importance. Not to mention, several others sites in the main islands (Oreor, Ngarekebesang, and Malakal) of Koror. However many of the sites are not easily accessible and are not areas open for visitors. Sites that are well-known attractions utilized by tourist and locals are the Japanese Zero and Ngeremdiu beach area & Lighthouse/Todai Trail.

Also it should be noted that with many cultural/historical sites, there is the dilemma of having a vast amount of cultural information about some sites while others have very little information. Another difficult circumstance is the substance of the cultural information. Despite the fact that studies on ancient settlements in the Rock Islands have been documented, the local traditional importance of sites are only available for a few sites while the others are unknown. The essentials about culture and history are on hand for areas such as Ulong and Ngeremdiu. The other sites however still need to be further assessed and established by Koror State and the Bureau of Cultural Affairs as registered cultural sites and if the sites are suitable visitor attractions. For more information on cultural and historical sites please contact the Koror State Community & Cultural Affairs or the national government Bureau of Arts & Culture.

Information Source: Koror State Department of Conservation and Law Enforcement

5.3 Best Practice Guidelines for Sites of Cultural & Historical Significance

Given the importance of these sites to Palauans in terms of their history and culture and concerns that exist in regard to its future, those visiting cultural sites should not engage in any type of behavior or activity that disturbs the integrity of this site or diminishes the respect that should be accorded to it.

- ✓ Remember to take everything you bring to the site with you when you leave.
- ✓ Do not remove anything from the site. Although you may not think something is significant to the site, all pieces make up the whole; if most tourists remove pottery sherds from a site, there will soon be none left.
- ✓ Remember that many sites include culturally sensitive areas and therefore behavior should always be respectful.
- ✓ Do not allow divers to touch any objects found in or around shipwrecks. In the past, divers have removed artifacts from wrecks, reducing their value as dive sites and diminishing their historical integrity. It is also dangerous to touch anything found in wrecks as there is often live ordinance present which could endanger people's lives.
- ✓ When visiting WWII sites, please ask tourists not to touch or climb on airplane remains. Remind them that in most cases a person or several people died at the site and it should be accorded the necessary respect.
- ✓ When visiting bai and other cultural sites, be sure to inquire about fees prior to arrival. Many States charge entrance fees or charge for photographs to be taken of their cultural and/or historical sites as in some cases, they cover the costs of maintaining the sites. Explain this to your tour group and ensure that they pay the necessary charge.

Sources and Additional Reading:

Ballendorf, D. A and King, P. (eds.) 1980. *Towards New Directions and Political Self-Actualization.* Micronesian Area research Center.

Hezel, F.X, 1983. *The First Taint of Civilization : a history of the Caroline and Marshall Islands in the pre-colonial days, 1521-1885.* University of Hawai'i Press.

An Account of the Pelew Islands (1877?) George Keate.

Chapter 6: Human Safety



6.1 An Overview

Traditional Knowledge
Traditional knowledge to all tour guides. Each site has specific types of currents and tides shifts throughout the day and season. A smart guide will check all the proper charts and written information. A smarter guide will also find out local knowledge about tides and currents from fisherfolk who have fished in particular areas for generations.

Human Safety
Prevention is the first rule for safety, avoid or prevent a problem in the first place and this begins with you!

Self serving – an individual must be properly trained mentally and physically in order to understand the dangers and safety precautions necessary for safe trips. A licensed diver is educated about human physiology in relation to the chemistry and physics of water and gases. A tour guide in Palau should also be trained on environmental conditions, the tides and currents.

Know your limits – How far can you swim? – In normal conditions, with the current, against the current, and in a storm? How deep can you free dive? What weight can you lift? EVALUATE YOURSELF!

Serving Others – in order to serve others, you must first serve yourself and then the additional responsibility required for other people. You must be able to evaluate their ability and limitations through questioning, observing and their actions. When is the last time they went diving? Are they assembling their equipment properly? How is their buoyancy in the water? Are they listening to your instructions?

Currents and tidal changes – there are several very strong and not always predictable currents (Peleliu express). Strong tidal changes can also produce additional changes in water movements.

Drug Use – 50% of all dive accidents are alcohol related and 4% are related to recreational drugs. Drug use results in poor judgment and slow reaction.

Shark and Triggerfish – there has been no reported shark attacks on divers. There have been several attacks on spear fishermen, because sharks target the fish caught. Triggerfish have been reported to attack diver's fins and even their face.

Tip: Don't panic. An arched back, slow movement, and a low tail are indications of an aggressive shark.

Depth perception – often in very clear water, like a vertical drop-off, it doesn't seem as deep as it is.

New Environments – unfamiliar reefs and animals may cause stress and fear in novice divers, orient divers as best you can on what to expect

Unfamiliar, Misuse of and lack of equipment – 15% of all dive accidents are caused because the diver had no watch! If you have equipment that you do not know how to use it can be a hazard.

Over-equipped – If your hands are not free and you have heavy equipment, it is difficult to hold on and move around.

Tip: Advise divers against the use of heavy camera equipment when conditions are not optimal

Information Source: The Environment, Inc. 1994 Tour Guide Handbook.

6.2 Diving Ailments

This section is designed to act as a source of reference for common problems and injuries that may occur on a typical dive. **ALL DIVE MASTERS AND TOUR GUIDES SHOULD BE CERTIFIED IN FIRST AID AND CPR EACH YEAR! Training is available at the Palau Red Cross Society.** You need to be certified by a qualified instructor in order to practice and administer first aid and CPR properly.

Decompression Illness

Decompression Illness (DCI) is a term, which encompasses decompression sickness and arterial gas embolism. This term is often used because the manifestations and management of the two disorders are often identical and because of the difficulty in distinguishing between them.

Decompression illness is caused by the presence of gas bubbles in our bodies. The bubbles may have entered the bloodstream as a result of breath holding or inadequate exhalation on ascent; or trapping of air in the lungs due to asthma, mucus, water inhalation, laryngospasm, cough, or cold. On the other hand, the bubbles could be excess nitrogen (or another inert gas), formed in the blood or body tissues as a result of inadequate decompression after a dive. DCI can and does occur on dives that are well within the no-stop limits of various dive tables, and on dives conducted in accordance with various dive computers.

The following factors may increase a diver's likelihood of getting decompression illness even if the tables/computers are followed correctly:

- Repetitive diving (especially multiday repetitive diving)
- Deeper diving (deeper than 80ft/24m)
- Rapid or multiple ascents
- Exercise before, during or after the dive
- Flying after diving
- Dehydration (seasickness, alcohol, diving in the tropics)
- Obesity
- Fatigue, lack of fitness, illness, stress, previous injury, heart defects
- Being cold
- Age – risk may increase with age

- Carbon dioxide excess
- Decompression stop diving
- Breath-holding during ascent
- Lung disease (due to increased risk of pulmonary barotraumas)

NOTE: If symptoms similar to those of decompression illness are present after diving, never exclude decompression illness because of what may appear to be a safe dive according to the tables or computer.

Signs and Symptoms

Although these usually occur within six hours of diving, they may develop 24 to 48 hours after the dive, or even later if there is altitude exposure after prolonged diving. Decompression illness is frequently accompanied by general malaise (feeling unwell) and extreme fatigue.

Although the symptoms of DCI sometimes disappear spontaneously, particularly if oxygen is breathed, medical evaluation and recompression are required to minimize tissue damage and later recurrence of symptoms.

Common Signs and Symptoms of DCI

Chest, torso, or back pain
Dizziness
Extreme fatigue
Headaches
Malaise
Nausea
Numbness/tingling sensations
Pain/discomfort at or near a joint
Weakness

Other Signs and Symptoms of DCI

Blood in stools
Blotchy skin
Confusion
Convulsions
Coughing
Death
Difficulty breathing
Difficulty passing urine
Hearing loss
Lack of coordination
Itchy
Loss of balance
Loss of bladder/bowel control
Paralysis
Personality change
Rash
Ringing in ears
Impaired consciousness
Speech disturbances
Visual disturbances

6.3 First Aid and CPR

The Palau Red Cross Society provides a course for community first aid and safety. The Course description and outline is shown below:

Palau Red Cross Society
P.O. Box 6043 Koror, Republic of Palau 96940
(680) 488-5780/5781
Fax: (680) 488-4540
E-mail: Palredcross@Palaunet.com

Course Outline: **Community First Aid and Safety**

Course Description: The main purpose of this course is to help lay responders recognize an emergency and feel more confident in their abilities to act aptly in the event of any emergency situation. Additionally, this course is designed to promote a safe and healthy lifestyle. Upon the completion of this course through a series of demonstrations and tests, one will be able to provide basic care that is necessary for injuries or sudden illnesses in infants, children, and adults.

This course certifies individuals for **CPR** *and* **First Aid and Safety**. It is a 10 to 12 hours course.

This course is divided into three components.

Component I: *Adult CPR*
Component II: *Infant and Child CPR*
Component III: *First Aid Basics*

Component I: *Adult CPR*

Participants in this course will be able to respond to an emergency. They will also be able to recognize an emergency, devise an emergency plan, provide appropriate information, and even demonstrate needed medical skills regarding conscious or unconscious victims.

§I Adult CPR

1. Responding to an Emergency/Emergency Plan
    a. Deciding to act/taking action
    b. Obtaining consent

2. Preventing Disease Transmission
3. Moving an Adult
4. Caring for Shock
5. Life-Threatening Emergencies: Checking an unconscious adult/child/infant

6. Life-Threatening Emergencies: Checking a conscious adult/child

§II Adult CPR

1. Adult CPR
    a. Breathing Emergencies: Helping a conscious choking victim
    b. Breathing Emergencies: Helping an unconscious choking adult
2. Breathing Devices
3. Rescue Breathing for an adult
4. Recognizing a heart attack
5. Cardiac Chain of survival
6. CPR: demonstration
7. Preventing Cardiovascular Disease

►Examination for § Adult CPR

Component II: *Infant and Child CPR*

Participants in this course will be able to respond to a breathing or cardiac emergency in infants and children.

§II Infant and Child CPR

1. Life-Threatening Emergency in Infants and Children
    a. Moving an infant or child
    b. Caring for shock
    c. Checking an unconscious child or infant
    d. Checking a conscious adult/child

2. Breathing Devices
3. Breathing Emergencies
    a. Helping a conscious choking infant
    b. Helping a conscious choking child
    c. Helping an unconscious choking infant
    d. Helping an unconscious choking child

4. Rescue Breathing
    a. Infant
    b. Child

5. CPR: Demonstration
    a. Infant and its purpose
    b. Child and its purpose

6. Preventing Emergencies in Infants and Children

►Examination for § Infant and Child CPR

Component III: *First Aid Basics*

Participants in this course will be able to recognize and care for victims of sudden illness and injuries.

§ I First Aid Basics

1. Injuries
    a. Wounds
    i. Controlling bleeding

    b. Burns
2. Injuries to muscles, bones, and joints
    a. Immobilizing muscle, bone, and joint injuries

3. Injuries to the head, neck, and body
4. Sudden Illness

►Examination for § First Aid Basics

Information Source: Miriam Chin, Executive Director for Palau Red Cross Society.

6.3.1 Hazardous marine animal injuries generally fall into four categories:

1. <u>Envenomations</u>

Spine Punctures	
Warning Signs	Puncture or laceration
Purple or black skin coloration	Immediate pain
Nausea	Vomiting
Shock	Swelling
Respiratory arrest	Cardiac arrest

6.3.2 Sea sickness

Although the subject of avoiding sea sickness may not be vital to proper supervisory technique, it is a common concern among boat divers. It is thought that sea sickness involves the vestibular apparatus of the inner ear and that visual / perceptual disorientation is a significant factor in causing the disorder. Based partially on fact and common experience, the following advice may be helpful in avoiding sea sickness:

1. Divers should avoid eating greasy foods prior to boarding and while aboard the boat.
2. If sea sickness medication is to be taken, advise divers to always know its effects before using it prior to diving. Be aware that due to significant side effects, trans-dermal medications (usually applied via a patch behind the ear) are not recommended prior to diving.
3. If the decision is made to take a known, acceptable medication for sea sickness, divers should be advised to always do so well in advance to departure (often the night before diving). Most medication is ineffective if taken when sea sick.
4. While underway, divers prone to sea sickness should be advised to remain on deck and not to go below unless necessary.
5. As visual orientation is thought to be very important in avoiding sea sickness, divers should be advised to maintain eye contact with the horizon or other stationary, land based object.
6. All divers should be advised to stay away form areas near to exhaust fumes.
7. Sea sickness- prone divers should be advised to try to stay busy while underway but should not read
8. Finally, advise sea sick-prone divers to always be prepared to enter the water as soon as possible. Most individuals become sea sick not while underway but after the vessel is at anchor. The less time spent on board, the less likely sea sickness will occur. Finally, if it should become necessary to vomit, have him do so over the leeward rail. Should the vomiting become persistent, have the diver rest in a cool, shaded area and drink fluids to avoid dehydration.

Information Source: PADI Dive Master Manual.

6.3.3 Accident Details Form

Name of Diver (s):

Diver Experience Level:

Details of dive:

Maximum depth

Dive time

Ascent rate

Safety Stop

Gas Used

Dives in Previous 48 hours

Accident Descriptions:

Location

Details

First Aid Administered

Further Treatment Advised

Information Source: Diver Alert Network

6.4 Dive Equipment

6.4.1 Dive Equipment: Proper Care and Storage

Taking proper care of your equipment and maintaining it regularly will help prevent serious malfunctions as well as increase the life span of your equipment.

All Gear including snorkel, mask, fins, wet suit, SCUBA gear and underwater equipment needs to be rinsed thoroughly with fresh water at the end of each diving day. The gear then should be stored in a clean, dry area where it can drain and dry properly.

6.4.2 Regulator Care

- store where it can drain and dry
- rinse gear thoroughly each day of diving
- wash with anti-bacterial solution (Nonoxunal 9) to kill bacteria
- Watch for roaches – they will eat the white silicon
- Coil hose – wears out faster if hung
- Spray regulator lightly with silicon every 3-6 months
- Check warranty for replacement parts

Tools

- adjustable crescent wrench, small Phillips screwdriver, O-ring remover, baggie with 12 extra O-rings and one extra exhaust diaphragm, zip strips, O-ring grease, "jack knife" tool kit

Common Problems

- O-ring is missing, loose, or broken
- Hole in mouth piece of regulator
- Flipped diaphragm
- Auto inflator is sticking

Three types of Corrosion

1. saltwater – green color
2. rust – reddish-brown
3. aluminum oxide – white

Recommended Overhaul = once per year

Information Source: 1994 Tour Guide Handbook

Cylinder Care:

Your scuba cylinder has been inspected against the standards of professional Scuba Inspectors (PSI) and the Compressed Gas Association by a Visual Cylinder Inspector. To keep your cylinder in the best possible condition, follow these recommendations.

1. Keep Moisture Out – retain 100-300psi within cylinder to assure valve is not inadvertently opened allowing water to be forced though the regulator into the cylinder. Release a mall amount of air from the valve and filter attachment prior to charging the cylinder.

2. Storage – cylinders should be securely stored vertically in a cool, dry place. The cylinder should be clean for storage. Rinse the exterior with freshwater after saltwater exposure. Fully filled cylinders should not be stored for long periods because corrosion is accelerated by the additional oxygen.

3. Handling – scuba cylinders, while resistant to rough handling, can be damaged. Cylinders can be dented if dropped. Cylinder boots are often poor shock absorbers. Valves sometimes open slightly when in transport. Be alert to the sound of escaping air.

4. Valve Care – Keep it clean. Tape commonly placed over the valve aperture after the cylinder is filled with air should be removed during long term cylinder storage because the adhesive may become dry and difficult to remove.

5. Cylinder boot and backpack – remove boot, cover, backpack or other dissimilar metal accessories occasionally to clean away salt deposits and inspect for any corrosion.

6. Your next Inspection – depends on a variety of factors – it is recommended that a PSI Cylinder Inspector is consulted.

Chapter 7: Water Safety



7.1 NATIONAL GOVERNMENT WATER SAFETY REGULATIONS

(Ministry of Justice Marine Law Enforcement)

All boats must apply for operating license. The following is a list of the requirements and regulations pertaining to the application for licensing procedure.

1. Requirement that all boats covered by this license shall have on board at all times a tool kit for basic engine repair and first aid kit.
    - It is required that the tool kit contain the following: one spark plug wrench, one pair of pliers, two sizes of flat head screwdriver and two sizes of Phillips screwdriver, one adjustable wrench, one full set of replacement spark plugs for one of the engines and at least one replacement fuel filter cartridge for any installed fuel filtration.
    - It is recommended that the first aid kit contain the following: sterile gauze compresses, adhesive tape, band-aids, hydrogen peroxide, burn ointment, sterile eye wash solution, cotton, and "sting stop," meat tenderizer or an equivalent marine sting relief formula.

2. Requirement that all boats covered by this license shall have on board at all times properly functioning radio equipment capable of communicating with on-shore radio equipment and facilities, such as a fully functional VHF marine radio.

3. Requirement that all boats covered by this license shall have on board at all times a sufficient number of personal floatation devices for all persons being transported. Buoyancy compensators used for SCUBA diving may be counted as a personal floatation device, but children's inflatable toys and buoys shall not be counted as personal floatation devices for the purpose of meeting this requirement. It is recommended that personal floatation devices be of Type I for commercial passenger carrying boats.

4. Requirement that all licenses shall allow a sticker or other form of identification and /or certification to be affixed or carried on board all boats by this license when required by the Board.

5. Requirement that all boat operator(s) of all boats covered by this license shall, before transporting passengers for hire, obtain an up-to-date weather forecast so that they can be forewarned of major weather disturbances, including, but no limited to, typhoons, tropical storms, etc.

6. Requirement that all boats covered by this license operating at night must be equipped with, and use, boat navigation lights.

7. Recommendation that all boats covered by this license shall have on board at all times a minimum of three aerial and three hand held safety flares all of which are within their imprinted service expiration date.

8. Restriction that all boats covered by this license shall not transport passengers in numbers exceeding the maximum carrying capacity of the boat as determined by

the boat manufacturer and/or the Water Safety Board and whose maximum carrying capacity is listed on the license.

9. Restriction that all boat operator(s) for all boats covered by this license shall not consume or be under the influence of intoxicating liquor or narcotic drugs immediately proceeding, or while, operating the boat. For purposed of this restriction, the standards for being under the influence of intoxicating liquor or narcotic drugs shall be the same as those used for 42 PNC 514 (for driving a motor vehicle).

10. Restriction that the boat operator(s) for all boats covered by this license shall be over the age of 18 years old, not mentally or physically impaired in any way that might impede or hinder safe operation of a boat, and have over one year of experience operating a boat. Boat operators for boats covered by this license shall be listed on the license application form for approval by the Board. Boat operator(s) approved by the Board shall be listed on the license. Before any boat operator(s) that are not listed on the license may operate a boat covered by this license while transporting passengers, the license shall notify the Board of the additional boat operator(s) and obtain the Board's approval of them.

Additional Requirements and Restrictions for Boats for Hire Carrying SCUBA Divers

1. Requirement that all boats covered by this license that are engaged in transporting, guiding, and supervising SCUBA divers shall carry at least one Supervising Diver who is a dive master (or who holds more advanced certification such as assistant instructor or instructor) with certification from a recognized diving organization. Diving certifications recognized by the Board shall be listed and kept on file pursuant to 34 PNC 5203 (e). The maximum in water Supervising Diver/SCUBA diver customer ratio is 1 to 10.

2. Each group of SCUBA divers engaged in diving shall be led and guided by a Supervising Diver. Use of safety divers to assist divers need not have dive master certification, but must hold a current diving card from a recognized diving organization and have done at least forty scuba dives. All SCUBA divers must present a diving card from a recognized diving organization or other positive proof of such certification to the licensee or Supervising Diver before diving; provided, however, that this is not required for student divers who are being taught by an instructor certified by a recognized diving organization.

3. Requirement that, before each SCUBA dive, the Supervising Diver on any boat covered by this license shall evaluate all dive conditions and make preliminary determination that the dive site is currently safe and suitable for diving. The Supervising Diver shall also determine, before diving, that the dive is suitable for the SCUBA divers in the group that is being guided and supervised, based upon the divers' skill level, training, experience, and other factors. The Supervising Diver shall complete a dive site briefing prior to every dive. The briefing shall include dive site description, maximum depth, bottom time, current direction and speed, safety considerations, pick-up point, and any special considerations.

4. Requirement that the Supervising Diver(s) on any boat covered by this license shall, before diving, insure that each SCUBA diver that is being guided and supervised inspects his/her own SCUBA gear to insure that such gear is in

proper working order. Each Supervising Diver shall be equipped with the following gear (in working order) on each dive in addition to his/her basic SCUBA gear: signal float (sausage), signal mirror, octopus regulator, wetsuit or dive skin, watch, dive tables (need not be carried on dive), dive computer or timing device. On any night dive the Supervising Diver must also be equipped with a waterproof strobe light and the boat should be equipped with a boat marker light.

5. Requirement that all boats covered by this license must fly the recognized red/white dive flag (signifying “diver down”) when engaging in diving activities. When not engaged in diving activities the flag must be furled. All boats covered by this license shall also be equipped with safety or current lines (floating polypropylene or similar line) of at least one-hundred feet in length connected to a float(s) in sufficient quantities to be utilized, when deemed necessary, by each diving group on board.

6. Requirement that all boats covered by this license shall require all SCUBA divers to dive with an inflatable diving safety sausage. If a SCUBA diver does not possess one, then one shall be made available for rental or purchase from the licensee for the dives with the licensee and every diver shall be instructed in its use before diving.

7. Restriction that all Supervising Divers and safety divers for all boats covered by this license shall not consume or be under the influence of intoxicating liquor or narcotic drugs immediately preceding, or while, carrying out their duties and responsibilities of supervising, guiding, and/or watching over divers.

8. Review of License Application

Upon receipt of the Application for a license and fee, the Board shall instruct a Water Safety Inspector and/or a Board member to inspect the applicant’s boat(s) and/or operations in accordance with 34 PNC 5271. After inspection, the Board shall issue the license upon receipt of a satisfactory inspection report.

7.2 Boat Requirements by National Law that each Guide needs to check

This is a basic outline of what a guide can check before using a commercial boat for the first time.

The **Division of Transportation, Ministry of Commerce and Trade** provides training, testing and licensing for all commercial boats in Palau. Every boat that carries tourists or is a boat-to-hire, must have the following according to National and Koror State Law:

1) An up-to-date registration number available upon request.

2) An up-to-date license for each boat captain available upon request.

3) Have required, well maintained safety equipment on board at all times including the following: VHF radio, tool kit, first aid kit, oxygen for SCUBA operations, personal flotation devices for all passengers, lights and a fire extinguisher.

For updated information or specific information questions on national requirements contact the Division of Transportation, Ministry of Commerce and Trade. For updated information or specific questions on State requirements contact the Koror State.

**Each tour guide needs to ensure that the skipper and boat meet national standards at all times for their own safety and the safety of their customers.

7.2.1. Boat Registration

The boat must be registered with the Ministry of Commerce and Trade and Koror State. An up-to-date registration number should be displayed on the boat.

7.2.2 Boater License

All skippers of boats-for-hire or commercial use need to have an up-to-date boaters license**.**

7.2.3 VHF (Very High Frequency) Marine Radio

Every tour or commercial boat should be equipped with a VHF Radio. All boaters should regularly monitor Channel 16 – the international Emergency Channel and the local emergency channels. Local Channels are as follows: Channel 3 or 5 are for Peleliu and Angaur, Channel 7 is for Koror and Channel 18 is for Northern Babeldaob. Do not use these channels unless there is an emergency.

7.3 Safety Equipment

7.3.1 Lights

Lights must be on from sunset to sunrise and during times of restricted visibility (eg. heavy rain) by all boats. Such lights include but are not limited to masthead lights, sidelights, range lights and stern lights. A maximum of five lights and a minimum of 3 must be running at the required times listed above.

7.3.2 Personal Flotation Device

Every person on board a boat must have one Personal Flotation Device (P.F.D.)

There are 4 types of PFD's for based upon the location, activities and likely time of rescue shown in the box below:

Personal Floatation Devices

Type I – for off shore cruising, racing and fishing, where rescue may be slow to arrive

Type II – inland cruising, dinghy sailing and dinghy racing, where rescue is likely in a relatively short period of time.

Type III – protected, inland water near shore, where there is a high chance of immediate rescue

Type IV –a throwable devise for an overboard victim or to supplement the buoyancy of a person overboard.

These P.F.D.s must be:

1) readily available,

2) in good condition,

3) properly sized for the passengers.

4) used by each passenger during rough weather

7.3.3 Fire Extinguisher

There are four types of fire extinguishers as shown below:

Type of fire extinguisher	Type of Fire
Type A	Ordinary combustible material
Type B	Gasoline, oil and grease fire
Type C	Electrical fire
Type D	Combustible Metal

There are two sizes of fire extinguishers as shown below:

Size	Foam (gal)	CO_2 (lbs)	Dry chemicals (lbs)	Halon (lbs)
B-I	1-1/4	4	2	2-1/2
B-II	2-1/2	15	10	---

Summary Table of Safety Equipment required by National Law for Each Class Size for boats.

Class	Boat Size (ft)	PFD Types I, II or III	PFD Type IV	Fire Extinguisher Type B-II	Whistle *	Bells*	Lights
A	<16	X	1	1			x
1	>16 <26	X	1	1	1		x
2	>26, <40	X	1	2	1	1	x
3	>40, <65	X	1	2	1	1	x

* Boats with outboard engines do not require whistles or bells, only boats with inboard engines

Information Source:
Boater Safety Manual. Division of Transportation, Ministry of Commerce and Trade.

7.3.4 Boat Maintenance

Maintained, with reliable engines and equipment to ensure the safety of its passengers. Several guidelines for proper maintenance are as follows:

- Rinse boat thoroughly with fresh water after a tour
- Bring boat up at least once a month
- Clean bottom algae, causes resistance and slows down boat – use household clorox
- Change spark plugs every two to three months
- Tune up engines every six months
- Lubricate all moving parts - use petroleum product (WD-40)
- Check engine for corrosion
- Grease engine with Marine Grease

Common Problems	Possible Causes
Lower Unit Trouble	Plastic caught on it
Engine Overheating	Plastic or leaves caught on it
Broken Impeller	Hard to Fix
Engine Dies	Fuel problem, Water in Gas, Loose Hose, Clogged Filter, water in gear
Engine Won't Start	Clip on ignition, Water in gas, Electrical Problem, Battery – scrape terminals with Sand Paper, Piston ring Blown

Information Source: 1994. The Environment, Inc. Tour Guide Handbook

7.4 Palau Marine Advisory System

The Palau Marine Advisory System is critical for all guides to understand and follow regarding local weather advisories. Below is the new brochure kindly provided by the National Emergency Management Office that contains all the necessary information as of 2005. Please call the NEMO office for updates.

National Emergency Management Office

NEMO

Republic of Palau

Palau Marine Advisory System



P.O. Box 10284

Koror, Palau 96940

TeL: (680) 488-2249/2422

Fax: (680) 488-3312

nemo@palaunet.com

Small Craft Advisory

A SMALL CRAFT ADVISORY

is issued by NEMO when marine conditions outside the reef and areas around Angaur and Kayangel are moderate to relatively rough. Traveling to these areas are allowed but caution is advised. If you venture out and water conditions are to rough, do not proceed to these areas.



An Advisory is in effect only when the **SMALL CRAFT ADVISORY** flag is flown.

The Advisory flag is white with red lettering.

FLAG LOCATIONS:

1. Arai (Surangel Marina)
2. Angaur
3. Kayangel
4. Koror State Rangers Marina (Next to Council of Chiefs Bldg).
5. Happy Landing
6. M-Dock (Corner of Fish N Fins)
7. Ollei Port
8. Palau Pacifc Resort
9. Peleliu
10. T-Dock

* Additional Locations coming soon are Melekeok Port and Ngeremlengui Port.

Listen to 87.9FM (ECO Paradise) and 1580AM, T8AA radio stations for Advisory/Warning announcements.

Emergency Contact numbers:

Police: 911

Fire/Rescue: 488-1411

Marine Law: 488-5206

Small Craft Warning

A SMALL CRAFT WARNING
is issued by NEMO when marine conditins outside the reef and areas around Angaur and Kayangel are extremely rough. Traveling to these areas is strictly prohibited. Travel within the reef system **ONLY** is usually allowed but NEMO should be contacted first.



A Warning is in effect only when the **SMALL CRAFT WARNING** flag is flown.
The Warning flag is red with white lettering.

Information provided by the National Emergency Management Office.

7.5 KOROR STATE WATER SAFETY REGULATIONS

(Koror State Department of Conservation and Law Enforcement)
effective as of October 1, 1995

7.5.1 Diving

1. Assure the safety of all participants
2. Maintain a level of professional competence equal to the standard established by Koror State Government.
3. Any boat taking customers out for scuba-diving or snorkeling and deep sea fishing must be equipped with : a first aid kit, a VHF 2-way radio, dive flag/float line and flotation devices (one piece per person aboard). Although not required by law, the DAN Emergency Handbook and an oxygen kit should also be brought on every tour.
4. The red/white or blue/white dive flags must be flown when in-water activities are in progress, and all white flags when fishing activities are in progress. At all other times, flags must be rolled or taken down.
5. Boats involved in night diving/ fishing activities must have adequate boat marker lights above water and an in-water working strobe marker.
6. Maximum depth for sports divers is 100ft.
7. Required in-water Dive Master: Customer ratio is 1:10
8. No spear guns or spear fishing activities shall be allowed when scuba divers are aboard.
9. In addition, taking any type of marine life, dead or alive, is strictly prohibited when engaged in scuba diving activities.
10. Working as a Dive Master, you must have required training and current certification.
11. Boat handlers/safety personnel must have current certification in CPR, training in First Aid and Rescue procedures.
12. Divers must present a certification card or positive proof of such certification before they are allowed to dive.
13. Extreme caution is required when approaching a dive site with divers in the water.
14. All shore divers are required to have a dive float/flag in the water. Shore divers should be informed of the Koror State Conservation laws and regulations.

7.5.2 Dockside Preparation Prior to Departure

Good communication with your passengers with respect to the safety of the dive or snorkel trip and a feeling of trust in the boat operation must be given to the guests prior to departing to the dive site.

1. **Greet guests –** help passengers aboard and ensure everyone is given instructions and space for their personal equipment.
2. **Roll Call –** require all dive operators to maintain records of passenger information and dive profiles.
3. **Welcome aboard introduction –** boat captain should provide comprehensive instructions for the safety and comfort of the passengers.
4. **Explain features of the boat –** where everything is located and the proper disposal of waste products.

5. **Explain procedures in setting up dive equipment and preparation of dive activities –** explain how you expect divers to handle their gear and their storage.
6. **Safety of the voyage**
7. **Review of Marine Conservation laws** – in order to dive/fish, all foreigners must have a proper permit.

7.5.3 Management/Evaluation procedures

Management is required to insure that boat crews are properly trained in these procedures and a quarterly review is held. All boat operators are required to have current certification in CPR, life saving procedures, First Aid and any certification held and required at the time of employment.

Injury Assessment and Priority of Evacuations:
The captain has the ultimate responsibility for injury and priority of evaluation determination.

- CLASS I : Boat will get underway immediately. This requires assessment of the total situation with consideration for the safety of divers remaining in the water. The captain has the ultimate authority to get underway but must consider the determents of the action. Following are considered as a Class I evacuation case – air embolism, deep laceration with arterial bleeding, respiratory/cardiac arrest, or any life-threatening situation requiring immediate care and requires treatment by shore-based facilities.
- CLASS II: Boat will get underway immediately upon diver recall. Captain may elect to use the main engines sounding to alert divers. Following are considered Class II evacuation cases – victim is complaining of chest pain, shortness of breath, paralysis or limb pains. A deep cut or wound without arterial bleeding or any injury requiring treatment at shore-based facilities but not life-threatening.
- CLASS III: Boat may or may not get underway according to the availability of shore-based rescue vehicles/personnel. The determining factor of speediness of this evacuation depends on the victim's state of mind and condition. Examples of Class III cases are – small cuts or abrasions, any illness of undetermined origin, and injury that would not necessarily require shore-based treatment. The boat operators are required to complete a full report of any accident and submit it to Koror State Department of Conservation & Law Enforcement as soon as possible or within 24 hours.

7.5.4 Moorings and Anchoring Instructions

1. Mooring - Each time a boat uses a mooring buoy, the boat operator is responsible for ensuring a proper hook up and inspection. It may be necessary to attach an additional piece of line or pick up line for a vessel that has higher bars. Always report discrepancies of mooring equipment to Koror State Dept. Conservation & Law Enforcement on the day of such finding.
2. Anchoring – Anchoring in the Rock Islands or anywhere within the State of Koror and/or causing damage to the local environment is illegal. When anchoring is required, please follow these guidelines:

a) Be familiar with white sandy holes in the area.
b) Using a donforth anchor type only. Lower the anchor into the sand by watching the anchor all the way down to the bottom. Boat captain should keep vessel positioned directly over the sand hole until his anchor reaches the bottom.
c) Once the anchor reaches the bottom, the captain/boat operator may back his boat slowly in order to set out line.
d) If diving, Dive Master should descend down on the anchor line and check position and security before continuing on the dive.

7.5.5 Emergency Information

Rough weather at sea / crossing the reef

a) Close all watertight and weather tight doors, hatches and air ports to prevent taking water aboard.
b) Keep bilges dry to prevent loss of stability due to water in bilges.
c) Keep passengers seated and evenly distributed. Have passengers put on life preservers.
d) If assistance is needed, call over radio or telephone to your respective main office, the local authority (Koror State Rangers ph # 488-2150 or VHF Channel 5 International). If you have a serious emergency call the National Emergency Office (NEMO) and the Bureau of Public Safety.
e) Give instructions to passengers concerning leaving the boat, staying together, and listening for instruction.

Man overboard

a) Post a lookout person to keep the people overboard in sight at all times.
b) Throw a ring buoy/float overboard as close to the person as possible.
c) Maneuver the boat to pick up the person in the water.
d) If a person is not immediately located notify Local Authority (Koror State Rangers and National Police) and other boat/vessels in vicinity by radio.
e) Continue the search until released by Authority.

Fire at Sea

a) Cut off air supply to the fire, close hatches, ports, doors, ventilation etc.
b) Immediately use portable fire extinguisher at the base of flames for inflammable liquid or grease fires or water for fire of ordinary combustible materials.
c) If fire is in the machinery space, shut off fuel supply and ventilations.
d) Maneuver boat/vessel to minimize effect of wind and fire.
e) If unable to control fire, immediately notify the Fire Department and Koror State Rangers and other boats in the vicinity by radio (VHF Channel 5 International).
f) Move passengers away from fire, have them put on life preservers and if necessary, be prepared to abandon boat/ship.

7.5.6 Boat Handling

Collision Rules

a) Between Power Boats: When two boats are coming at each other head on, each boat driver should steer right (starboard) so that they pass each other on the left. When two boats are heading generally in the same direction, but on a collision course, the boat on the left yields to the boat on the right.
b) Between Power Boats and Sail Boats: Generally, it is the duty of the power boat to keep out of the way of sailboats. However, this does not give the sailing boat/vessel the right to hamper the safe passage of a power boat/vessel.

7.5.7 Port Regulations

Power Boats

a) It is the duty of any person having control of a power boat to navigate so as to avoid collision or injury to any person or vessel in the same area or disturbed by its wake. The boat must be managed with due care and consideration with regard to the prevailing conditions and the likelihood of other person being present or coming into the area occupied by the boat or its wake. You are responsible for the effects of your wake as you are for the effects of the boat itself.
b) No boats or vessels may exceed a speed of five (5) knots when in Malakal Harbor area in Koror State.
c) Sixteen (16) is the minimum age required to operate a power boat. A boat operator under this age may do so only if under the supervision of an adult.
d) Boat operator must obey orders from Koror State Marine Law Enforcement personnel.
e) Every person in a power boat is considered to be in control of the vessel for the purposes of assigning fault or liability for violations of these rules. In the case of a dive boat, all staff would be held responsible for a violation.

7.5.8 Diving Rules

a) No power boat may come within 100 yards of a diver's down flag or light. You must not display the divers down flag unless you have divers in the water. The only exception is in a rescue operation.
b) Diving is restricted to an area within 100 yards of the divers down flag or light.
c) No person may swim or dive in a navigational channel and Malakal Harbor, except a rescue or an authorized operation.

7.5.9 Ski Boats

a) There must be two people operating a ski boat. One at the wheel and the other acting as a lookout person and all must wear a life preserver.
b) No skiing is allowed within any navigational channel, Malakal harbor, Dive Site or Rock Islands.

7.5.10 Personal Watercraft (See Koror State Personal Watercraft Regulations)

a) Personal watercraft (PWC) operators are required to wear a life preserver to include passengers.
b) Personal watercrafts are not allowed to be operated within any navigational channel, Malakal Harbor and all Rock Islands.
c) Personal watercrafts are only allowed in the designated areas. Please check with Koror State Rangers for detailed information.

7.5.11 Fishing Boats

a) Stay clear of all fishing boats.
b) Look out for the boats which are tailing off beyond the drop off. They often have very long anchor/mooring lines which are often marked with a small buoy.
c) Watch for your wake. Many people fish in a very small boat. Not only may your wake disturb them, it may create a danger of capsizing a small boat.
d) Trolling fishing boats often use very long lines. If you see a boat trolling, stay very wide from it to avoid getting tangled up with the trolling lines.

Have fun but remember, the life you save may be your own!

7.6 KOROR STATE PERSONAL WATERCRAFT REGULATIONS

(K7-139-2003) effective as of May 2003

7.6.1 Section I

AUTHORITY

These regulations are promulgated and enforced by the Governor of Koror. They will be effective sixty (60) calendar days after becoming law, and shall have the force and effect of law and bind every person within the state's jurisdiction, except as to personal watercraft being used for governmental purposes, including emergency rescue and environmental and/or scientific research or study (provided such personal watercraft is clearly marked and identifiable as being primarily used for governmental purposes), and to personal watercraft being operated by participants in a professional exhibition or a regatta, race, marine parade, tournament, exhibition or water safety demonstration (provided such event occurs with the Governor's prior, express written permission and pursuant to event rules and regulations also approved by the Governor and enforced by the event's sanctioning body and/or officials). Each ticketed violation hereunder shall carry a One Hundred Dollar ($100) fine and/or ninety (90) days of incarceration.

These regulations are based upon the best available information – a body of knowledge that continues to evolve as more jurisdictions around the world adopt and promulgate similar regulations. Therefore, the Governor reserves the right to modify these regulations when and as he deems wise in light of then-current scientific and/or regulatory findings.

7.6.2 Section II
BACKGROUND

Personal watercrafts are typically propelled by an inboard, internal combustion engine that drives a water jet. Engines are largely two-stroke; although the four-stroke engine is growing in popularity and use. They generally use a gas-oil mixture that, as with outboard motorboat two-stroke engines, can deposit significant amounts of harmful and long-lasting pollutants into state waters. They can disrupt our delicate underwater ecosystem and their high-pitched whine can disturb wildlife and individuals nearby. This may ultimately result in fewer tourists pursuing more traditional activities like boating, diving, snorkeling, hiking, camping, bird watching, canoeing and kayaking. It should also be noted that accidents often occur when inexperienced users operate personal watercraft without proper instruction and when experienced users attempt acrobatic maneuvers, sharp turns and/or wave jumping.

Inspired by our concern over the foregoing, our state has chosen to promulgate a system of "water surface use management" to balance the community's safe enjoyment of state waters with the preservation of our delicate underwater ecosystems.

7.6.3 Section III
DEFINITIONS

As used in these regulations, unless the context otherwise requires, the following terms and those defined throughout shall have the meanings ascribed to them.

a) "**Channel**" means the deepest part of any waterway (through which the main current flows) or the part of a body of water deep enough for navigation through an area not otherwise suitable for navigation.

b) "**Idle speed**" means the PWC's slowest possible speed (which can in no event cause a noticeable wake or be greater than five (5) knots).

c) "**Operate(d)**" means to be in charge of a PWC while it is under way and not secured.

d) "**Operator**" means the person who is in charge of a PWC being operated.

e) "**Owner**" means a person who claims (or is entitled to) the lawful possession of a PWC by virtue of that person's legal title to (or equitable interest in) a particular PWC.

f) "**Person**" means an individual, corporation, limited liability company, partnership, association, governmental entity or other legal, business or organizational entity.

g) "**Personal watercraft**" and "**PWC**" means a powered, on-water vessel that is designed to be operated from a sitting, standing or kneeling position on – rather than within – the hull, and is equipped with an internal combustion engine that powers a water jet pump that cannot be disengaged to prevent the vessel from

making headway, as typified by, but not limited to, Jet Skis, Sea Doos, Wavejammers, Waverunners, Wetjets, Wet Bikes and Surf Jets.

h) "**State**" means Koror state in the Republic of Palau.

i) "**State waters**" means the twelve (12) nautical miles (1.85 kilometers) of water defined in and determined by Article 1, Section 1 of the state Constitution.

j) "**Type I Personal Flotation Device**" means a non-inflatable device designed to turn an unconscious person in the water from a face down position to a vertical or slightly backward position and to have more than twenty (20) pounds or 9 kilograms of buoyancy.

k) "**Type II Personal Flotation Device**" means a non-inflatable device designed to turn an unconscious person in the water from a face down position to a vertical or slightly backward position and to have at least fifteen point five (15.5) pounds or 7 kilograms of buoyancy.

l) "**Type III Personal Floatation Device**" means a non-inflatable device designed to keep a conscious person in a vertical or slightly backward position and to have at least fifteen point five (15.5) pounds or 7 kilograms of buoyancy.

m) "**Use(d)**" means to operate, navigate or employ.

n) "**Vessel**" means each and every craft capable of being used as a means of transportation on water.

7.6.4 Section IV

GENERAL RESTRICTIONS

Every PWC must at all times be operated in a reasonable and prudent manner and shall never be operated to chase or harass wildlife or at greater than idle speed within one hundred (100) feet of any shoreline, dock, swimmer, diver, snorkeler or a non-PWC vessel.

No PWC may be modified after-market to increase its speed, thrust or noise emissions. Every PWC must have:
(i) a properly operational self-circling or lanyard-type engine cutoff switch that, at all times during the PWC's use, is attached to the PWC operator (or the operator's clothing or life preserver);
(ii) a spring-loaded throttle mechanism that, when tripped, automatically and immediately returns the PWC to idle speed; and
(iii) a line and anchor capable of securing a non-operational PWC.

No PWC may be used to tow any individual unless the respective PWC manufacturer's user manual expressly permits same and the PWC has, in addition to the operator, a rear-facing individual passenger to continuously monitor the progress of the person(s) being towed.

7.6.5 Section V
AGE RESTRICTIONS

Except for in an emergency, no individual under the age of thirteen (13) shall operate a PWC. Nor shall any individual under the age of seven (7) be a passenger on a PWC unless said PWC is, at that time, being operated by that individual's parent or legal guardian. An owner shall not authorize or knowingly permit the owner's PWC to be operated in violation of this section.

7.6.6 Section VI
TIME RESTRICTIONS

Except for in an emergency, no person shall operate a PWC after seven (7) p.m. or before six (6) a.m.

7.6.7 Section VII
LOCALE RESTRICTIONS

The Governor shall designate buoyed areas in which PWC use is permitted. These areas shall be known as "Water Sport Zones". A PWC shall not be operated outside of a designated Water Sport Zone unless it is being operated at an idle speed or is headed toward the nearest Water Sport Zone or from one Water Sport Zone to another. When heading from shore to the nearest Water Sport Zone or from one Water Sport Zone to another, an operator must proceed thereto via the best available channel. Notwithstanding anything herein to the contrary, PWC operation, even at idle speed, is prohibited among and within one hundred (100) meters of the Rock Islands, and within any Rock Island bay and the state's commercial port area.

There will initially be four (4) Water Sport Zones. The Governor may designate additional areas as he determines necessary.

Water Sport Zones

The four (4) initial Water Sport Zones will be located at:

- **a)** the Koror side of the Renrak waiting house
- **b)** the Meyuns old Skozyo sea plane ramp,
- **c)** the deep-water lagoon at the northern end of the Llebuchel Channel (between Echang and Uchulangas).
- **d)** the T-dock west ramp at Arkemais, and at Station Harbor,

The Water Sport Zones' water surface size and perimeter will be determined by the Governor. The placement of these initial Water Sport Zones has been approved by the Koror State Department of Conservation and Law Enforcement because the locations are, in the Department's estimation, unlikely to be degraded by noise and water pollution (as they are already impacted by human activity), are not in ecologically sensitive areas, have good water circulation (which enables the flushing of any discharged oil and fuel), and are largely open (thus dissipating PWC noise). Further, these areas have established land entry points (i.e., docks), provide deepwater access and have the generally calm waters suitable for PWC operation.

7.6.8 Section VIII
DEPTH RESTRICTIONS

No person shall operate a PWC where the water is less than five (5) feet deep, as determined by an absolutely vertical measurement from the water level downward to the sea floor, unless the PWC is located within a Water Sport Zone or the PWC is proceeding at idle speed to be imminently docked, launched or otherwise secured.

7.6.9 Section IX
CAPACITY RESTRICTIONS

No more than one operator and one individual passenger are permitted on a PWC simultaneously, unless expressly authorized by the PWC manufacturer's user manual. No more than one individual may be towed by a PWC unless expressly authorized by the PWC manufacturer's user manual.

7.6.10 Section X
SAFETY EQUIPMENT REQUIREMENTS

Every PWC operator, passenger and person being towed by a PWC shall wear a Type I, II or III personal floatation device while on a PWC or in or on the water. Every PWC shall at all times contain a signaling device, paddle, tow strap, and a functioning, waterproof, battery-operated flashlight. In addition, a radio or cellular communication device is strongly recommended.

7.6.11 Section XI
DEALER RESTRICTIONS

Any person offering a PWC for sale within the state shall procure and maintain a valid business license from the state and shall provide every PWC buyer with a summary of all laws and regulations governing PWC operation in state waters and shall, on request, provide instruction free-of-charge regarding safe PWC operation. Every such dealer shall require each PWC purchaser to acknowledge in writing that the purchaser has been provided with a summary of all laws and regulations governing PWC operation in state waters and that the purchaser has read and understood them. The dealer must retain each signed form for no less than six (6) months from the respective sale's date. This Section XI shall not apply to private individuals offering for sale no more than one (1) at any given time.

7.6.12 Section XII
RENTAL RESTRICTIONS

Every person offering a PWC for rent within the state shall procure and maintain a valid business license from the state and shall provide every renter with:

a) a summary of all laws and regulations governing PWC operation in state waters;
b) a Type I, II or III personal flotation device, and all other equipment required herein; and

c) instruction free-of-charge regarding the safe operation of PWC (which shall include basic PWC operation and control skills, and distress and emergency protocol).

Every person offering a PWC for rent within the state shall also: (a) procure and maintain no less than Two Hundred and Fifty Thousand Dollars ($250,000) of liability insurance to cover all damage caused by such person and/or any of such person's PWC renter(s) to the environment and/or any third party or personal or real property; (b) require each of such person's PWC renters to acknowledge in writing that such renter has been provided with a summary of all laws and regulations governing PWC operation in state waters and that the renter has read and understood them (and shall retain each signed form for no less than six (6) months from the respective rental date); and not rent – or offer to rent – any PWC to any individual less than eighteen (18) years of age or anyone who is, in the reasonable determination of the individual offering the PWC for rent, under the influence of any drug or alcohol.

7.6.13 Section XIII
OWNER LIABILITY

A PWC owner is liable for all injuries caused by the negligent operation of said owner's PWC (excepting persons offering a PWC for commercial rental). It shall be refutably presumed that a PWC is being operated with the owner's knowledge and consent if the PWC is being operated by the owner's son, daughter, spouse, father, mother, brother, sister or other immediate member of the owner's family.

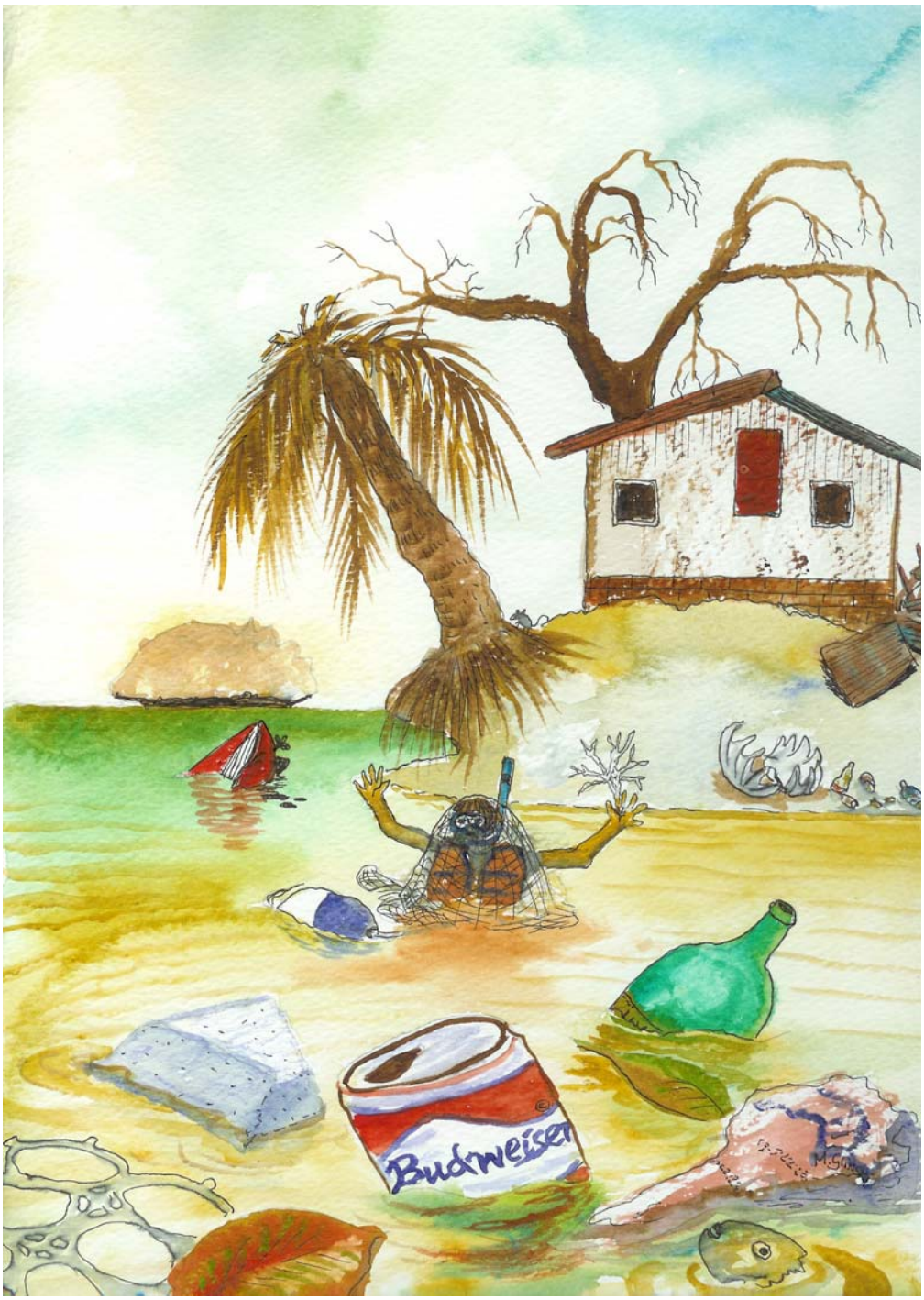
7.6.14 Section XIV
PROSPECTIVE, 2-STROKE ENGINE BAN

Commencing on January 1, 2006, 2-stroke engine PWC will be prohibited.

7.6.15 Section XV
OPERATOR DRUG AND/OR ALCOHOL USE PROHIBITION

In addition to any other Koror State Public Law or Republic of Palau dictate, no PWC operator may be under the influence of any drug or alcohol.

Chapter 8: Environmental Regulations



8.1 KOROR STATE ROCKS ISLANDS MANAGEMENT

The Traditional Leaders of Koror and the Koror State Government own and have jurisdiction over the entire Rock Islands Southern Lagoon 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.



The staff of the Koror State Department of Conservation and Law Enforcement.

The State's Department of Conservation and Law Enforcement is responsible for running the Management Area and enforcing State 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. Traditional authority is still equally authoritative 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.

For the past two years (2002 – 2004), the Department was focused on developing a comprehensive management plan for the Rock Islands Southern Lagoon. This 5-year Management Plan is the product of that collaborative effort with The Nature Conservancy and Palau Conservation Society.

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.

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.

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, which is the Year 2000 Rock Islands Management and Conservation Act. The State Government allocates not less than 50% of the revenue generated from the sale of Rock Island Use Permits (as established by K6-113-2000) to fund the department's programs and activities within the Management Area.

This year, 2007, the Rock Island Use Act was amended to establish a separate permit for the Jellyfish Lake ($35) and increased the Rock Island Use Permit ($25). The duration of these permits is 10 days from the date of purchase. All the revenue derived from the sales of these permits will be used to fund the the management of the Rock Islands Southern Lagoon Area and specific management for the Ongeim'l Tketau, Jellyfish Lake.

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.

8.2 KOROR STATE ENVIRONMENTAL AND CONSERVATION LAWS

Table 1: 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 of terrestrial life by non-residents of the State, & the taking of domestic animals to the Rock Islands.		1973
Littering and Trash Disposal	Prohibits littering and any disposal of trash in the Rock Islands	K2-34-89	1989
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
Rock Islands Management & Conservation Act Amendment	To require a separate permit and payment of a $35.00 fee for persons to enter Jellyfish Lake, and increase Rock Island Use fee to $25.00. Duration of the permits to be 10 days. Also establishes the use of fee collected, to regulate activities in Jellyfish Lake, and prohibit entry to other Jellyfish Lakes.	K8-180-2007	2007
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

Boating			
Boat Registration Act	Requires motorboat owners that reside in Koror to register boats to operate within State waters.	K6-99-99	1999

Table 1 continued: Koror State Acts & Regulations relevant to the Management Area

Regulation	Purpose	Reference	Effective
General Resource Use			
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
Personal watercraft (Jet ski) & 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, burning, 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 Ngederrak Reef a permanent conservation moratorium.	K7-156-2005	2005
Ngerkebesang Conservation Zone	Prohibits fishing, hunting, taking or disturbance of any marine flora & fauna.	K7-136-2002	2002

Table 2 Designated Tourist Areas and Regulations

Jellyfish lake (Ongeim'l Tketau) on Mecherechar Island* Requires a Jellyfish Lake permit to enter.

Tourist Activity Areas. To go these areas you must have a Rock Island Use Permit or a Jellyfish Lake Permit.

- Bablomekang Island
- Ioulomekang Island
- Beach Areas (Ngermeaus, Ngeanges, Ngchus, Ngchelobel, Ngeroblobang, and Bkul chotuut)
- Ngeremdiu Todai Trail (German Lighthouse)
- Ulong Islands

All other land is reserved for Palau residents. Tourists may access all water areas except **Ngkisaol Sardines Sanctuary**, **Ngerukuid Islands Wildlife Preserve**, **Ngederrak Reef and all other marine lakes**.

Regulations

- Beginning on May 1, 2007, Any visitor entering Palau on a tourist visa must have a valid **Jellyfish Lake permit or a Rock Island Use Permit** to use the area. For a visiting tourist to experience the Jellyfish Lake, they must purchase a **Jellyfish Lake Permit at $35.00 and is valid for 10 days**. It allows entry to Ongeim'l Tketau, Jellyfish Lake on Mecherechar Island and scuba diving at all areas outside the Jellyfish Lake, snorkeling, kayaking, boat touring and land activities on designated tourist activity areas.
- The **Rock Islands Use Permit** will no longer include the Jellyfish Lake. This permit costs $25.00 and is valid for 10 days. This allows a tourist to snorkel, kayak, boat tour, scuba diving and go on land tour activities on the designated tourist activity areas mentioned above, except Jellyfish Lake.
- The Jellyfish Lake Permit includes all areas covered by the Rock Island Use Permit, plus Jellyfish Lake. Permits are valid for ten days from the date of purchase and are not transferable. No permit is necessary for children under the age of six. Palauans and resident aliens may continue to enjoy the Rock Islands and Jellyfish Lake just as they do now.
- 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).
- The appropriate permit must be in the possession of the tourist at all times while in the Rock Islands and must be presented upon demand to Koror State law enforcement personnel. Koror State will post a person at or near Jellyfish Lake to inspect the Jellyfish Lake permit and to ensure compliance with this law. The boat or tour operator may hold the permits while the tourists are visiting Jellyfish Lake.

Table 3: 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. Also no entry.
- 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 4: Koror State Land Crab Regulations

The harvesting restrictions listed in Table 7 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 undersized land crabs, smaller than 3 inches (largest carapace width) and the taking, possession, sale, or exchange of land crabs with eggs (berried) at any time.

SUMMARY OF KOROR STATE ENVIORNMENTAL LAWS
(as of August 2004)

TROCHUS MPAS

- **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 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 there from equal to not more than $25.00 or imprisonment for not more than thirty (30) days, or both.

SHELL-COLLECTING

- **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.

PHOTOGRAPHY & FILMING

- **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.

FISHING BY RESIDENTS ONLY

- **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 person who is not a resident of Koror Municipality may fish, 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.

LITTERING

- **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.

SHIPWRECKS

- **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 the 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 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.

PORT COMMISSION

- **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.

FISHING LICENSES

- **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) spear fishing 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.

LIVEABOARDS

- **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.

SARDINE PROTECTION

- **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 of 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

NO BOATS IN NGEMEILS COMPLEX

- **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, Iilblau, 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.

REGISTERING BOATS

- **Koror State Public Law No. K6-99-99 (which amends and supercedes 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.

NGERUKEWID MPA

- **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.

NGERUR ISLAND

- **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.

DOCKING FEES

- **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.

MANGROVE PROTECTION

- **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.

ROCK ISLAND MANAGEMENT & CONSERVATION ACT, 2000

- **Koror State Public Law No.** K8-180-2007 amends sections of **K6-113-00 as amended by** K6-126-2001 **(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 amendment establishes a higher Rock Islands Use Fee in the amount of $25.00, to remove the Ongeim'l Tketau Jellyfish Lake on Mecherechar Island (hereafter referred to as "Jellyfish Lake") from the Tourist Activity Areas and create a separate Jellyfish Lake Permit in the amount of $35.00 which would include all the areas covered by the Rock Island Use Permit, to establish restrictions on the use of Jellyfish Lake and prohibitions on the use of other Rock Islands lakes that contain jellyfish, and to establish penalties for violations.
- Beginning April 1, 2007, the fee for a "Rock Island Use Permit" increased to $25.00. Jellyfish Lake will no longer be included in the areas open to tourists covered by this permit. If tourists wish to visit Jellyfish Lake they must purchase a "Jellyfish Lake Permit" for $35.00. The Jellyfish Lake Permit includes all areas covered by the Rock Island Use Permit, plus Jellyfish Lake. Permits are valid for ten days from the date of purchase and are not transferable. No permit is necessary for children under the age of six. Palauans and resident aliens may continue to enjoy the Rock Islands and Jellyfish Lake just as they do now. Tour operators and their employees (as well as Palauan citizens and resident aliens) are prohibited from accompanying or transporting any tourist to a non-Tourist Activity Area and from accompanying or transporting any tourist, without the appropriate permit, to a Tourist Activity Area or Jellyfish Lake. It is unlawful to forge or alter a permit. Any person found violating this Act will be charged with a misdemeanor and may be sentenced, upon conviction, to a fine of up to $100.00 and/or ninety days in jail. Each person without a valid permit will be considered a separate offense. The Governor may refuse to sell permits to any person or tour operator who has violated the provisions of this Act. Tour Operators are required to post a notice at their operating site that contains the following language:"NOTICE: ALL TOURISTS 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 YOUR TOUR OPERATOR. THE PERMIT MUST BE IN YOUR POSSESSION OR CONTROL AT ALL TIMES." The new permits and fee requirements take effect April 1, 2007. The following prohibitions are in effect now: Jellyfish Lake Prohibitions:It is unlawful to remove, capture, or possess any marine life, to wear gloves, or to bring in any living or non-living organisms. Prohibition Against Entry to Other Marine Lakes that Contain Jellyfish: It is unlawful to come within 200 feet of any other marine lake that contains jellyfish. This applies to all persons, including Palauans. This amendment also establishes that only the Governor has the authority to waive permits for diplomatic, educational, and other officials, and guests.
- Koror State Public Law K6-113-2000 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 Ngermeaus; 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 Palauan 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 Act for the Rock Islands.

NGEDERRAK REEF MPA

- **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 "Ngederrak" 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.

DAMAGING CORAL REEFS

- . **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.

NGEDERRAK REEF MPA

- **Koror State Public Law No. K6-133-2002** This Koror State Public Law, effective as of approximately July 2002, amends section 2(D) of K6-119-2001 by extending the conservation moratorium for Ngederrak Reef from two to four years.

NGERKEBESANG CONSERVATION ZONE

- **Koror State Public Law No. K6-136-2002** This Koror State Public Law, effective as of approximately November 2002. Located to the west of Ngerkebesang Island and the Palau Pacific Resort. The boundaries include all areas below the highest high tide watermark, within the boundary from the breakwater at Ngereksong 100 meters west, and south to Ngerdis point, to the shore at the Palau Pacific Resort. Demarcation markers have defined this area. There will be: No Fishing, capture, remove, touching, or otherwise disturb any form of marine flora or fauna. Marine flora and fauna means all forms of corals, invertebrates, fish, and other living organisms of any kind. The Governor of State of Koror may provide written authorization to any person to undertake conservation measures consistent with the provisions of this Act or to remove or deal with any flora or fauna for the purpose of conducting scientific studies or research. The Palau Pacific Resort management shall take all steps reasonable and necessary to inform the guests and visitors of the boundaries and restrictions of the Conservation Zone. It shall be unlawful for any person to fish for, capture, net, take, molest, destroy, alter, move, remove, touch, or otherwise disturb any form of marine flora or fauna in the Ngerkebesang Conservation Zone. The prohibitions do not include the removal of litter, trash, debris, or other inorganic objects that may have organisms growing on or in such foreign objects.

FISHING LAW (AMENDMENT)

Koror State Public Law No. K6-138-2003 This Koror State Public Law, effective as of approximately May 2003, amends and repeals certain portions of KSPL K4-68-95. Specifically, the new law: Prohibits non-Palauans from fishing in Koror (unless from a boat) and Increases to $200 per year or $20 per month the fee charged to non-Palauans

for a non-commercial fishing license. A non-Palauan's net fishing license will be $50 per month.

PERSONAL WATERCRAFT/JET SKI REGULATIONS

Koror State Public Law No. K6-139-2003 This Koror State Public Law, effective as of approximately May 2003, regulates the operation of "jet skis" and similar motorized watercraft, and authorizes the Governor to promulgate regulations for use and operation of jet skis and other jet boats. It shall be unlawful to operate a jet ski or jet boat on, in, or over any water that is less than ten (10') feet deep. It shall be unlawful to operate any jet ski or jet boat on or in any water over any fringing reef, barrier reef, or patch reef unless there is at least ten feet (10') of water over such fringing reef, barrier reef, or patch reef. It shall be unlawful for any person operating a jet ski or jet boat to flee from any Koror State law enforcement officer who is enforcing this Act. It shall be unlawful for any person while operating a jet ski or boat to fail to stop or fail to obey the lawful directives of any Koror State law enforcement officer relating to the use or operation of such jet ski or jet boat.

8.3 NATIONAL GOVERNMENT ENVIRONMENTAL LAWS

Restrictions Applicable to Forest and Terrestrial Areas

- No hunting, killing or taking eggs from any birds except Malk-Red Jungle Fowl (*Gallus gallus*),Uek-Purple Swamphen (*Porphyrio porphyrio*), Aiako-Greater Sulphur-crested Cockatoo (*Cactua galerita*), and Tengadidik-Collared Kingfisher (*Halcyon chloris*).
- No dumping of trash, litter must be removed from land and marine areas.

Table 5: 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 (Meas)			X	X	X							
Blacklip Pearl Oyster								X	X	X	X	X
Sea Turtles (Melob, Ngasech)	X					X	X	X				X

PNCA Title 24

• Environmental Quality Protection Act (§§ 101-103) Seeks to provide Palau with a healthy environment and natural resources in order to fulfill social, economic and other requirements of present and future generations.

- The Environmental Quality Protection Board (§§ 121-130) is entrusted to regulate earthmoving, marine and freshwater quality, toilet facilities, solid waste management, pesticides, public water supply systems and air pollution control.

- Environmental Impact Statements (§§ 141-143)

- **Implementation, Enforcement and Court Action (§§ 161-172)**

• **Endangered Species Act of 1975 (§§ 1001-1012)** seeks to prohibit harvest (possession) and commercial activity (including export) involving those species that are listed as Threatened or Endangered by the Minister of Resources and Development. This law has never been applied since the Ministry of Resources and Development has never adopted the regulations set forth in the Act (i.e. never announced a list of Threatened or Endangered Species for the Republic of Palau).

• Protected Sea Life sets regulations relating to the harvest (possession) and commercial activity (including export) of
the following species:
- Turtles (§ 1201)
- Sponges (§ 1211)
- Mother-of-Pearl (§ 1221)
- Dugong (§ 1231)
- Trochus (§§ 1241-1246)

• Illegal Methods of Capture outlaws the following methods of harvest for marine species:
- Fishing with Explosives, Poisons or Chemicals (§§ 1301-1305)
- Other Prohibitions (§§ 1321-1326)

• **Protected Land Life** Prohibits the hunting or killing of any bird and taking of eggs in Palau, except for 4 species.*
    - All Birds (§ 1401) except for *Gallus gallus, Porphyrio porphyrio, Cacatua galerita*, and *Halcyon chloris*
    -

• Preserves and Protected Areas created the following conservation areas:
- Ngerukewid Islands Wildlife Preserve (§§ 3001-3004)
- Ngerumekaol Spawning Area (§§ 3101-3103)

• National Heritage Reserve System (NHRS) Act (§§ 3201-3207) establishes a mechanism for designing, recording, and managing conservation areas based on nominations from the Ministry of Resources and Development. The following categories were created:
- National Heritage Area
- National Heritage Preserve
- National Heritage Reserve
- National Management Area

• Palau International Coral Reef Center Act of 1998 (§§ 3301-3328) establishes a self-sustaining, non-profit coral reef center and marine park that will provide a forum for coral reef studies, research, and education. The Center is designed to assist in improving the management, use, and conservation of Palau's and the world's marine environment, in addition to serving as a tourist attraction.

PNCA Title 27

• Foreign Fishing (§§ 101-102) enacts its own fishery zone legislation to manage, conserve, and regulate the harvesting of fish throughout their habitat, both within the reef areas of islands and atolls, and in other areas within the jurisdictional competence of the Republic.
- Ministry of Resources and Development (§§ 121-125)
- Fishery Zones (§§ 141-147)
- Regulation of Foreign Fishing (§§ 161-173)
- Enforcement and Penalties (§§ 181-190)
- Monitoring of Foreign Vessels in Exclusive Economic Zone (§§ 201-207)

• **Marine Protection Act of 1994 (§§ 1201-1211)** protects certain marine species and natural resources in order to promote sustainability of the marine commons while preserving the livelihood of the commercial fisherman of Palau.
This Act regulates:
- Groupers
- Humphead Parrotfish
- Napoleon Wrasse
- Rabbitfish
- Rock Lobsters
- Sea Cucumbers
- Mangrove Crabs
- Coconut Crabs
- Giant Clams
- Aquarium Fish
- Marine rock, hard corals, and sponges
- Gear Restrictions (SCUBA, gill and kesokes nets)

Table 6: Invertebrate Species Regulated by National Law

Palauan name	Common name	Scientific name	Minimum size	Harvesting season	Other restrictions
Cheraprukl; Raikilius; Bleyached; Melech	Rock Lobsters	*Panulirus versicolor* *Panulirus penicillatus* *Panulirus longipes femorstriga*	6 inches total length of the carapace	Open	No export; no taking of egg-bearing females whatever the length
Emang	Mangrove crab	*Scylla serrata*	6 inches greatest distance across the carapace	Open	No export; no taking of egg-bearing females whatever the length
Ketat	Coconut crab	*Birgus latro*	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	*Tridacna gigas* *Tridacna squamosa* *Tridacna derasa* *Tridacna maxima* *Tridacna crocea* *Hippopus hippopus* *Hippopus porcellanus*	No	Open	No export (except cultured specimens)
Semum	Trochus	*Trochus niloticus*	3 inches basal diameter	Designated from year to year by OEK	State Government can designate closed areas during open seasons
Chesiuch	Blacklip pearl oyster	*Pinctada margaritifera*	4 inches diamater across the shell	Closed August thru December	
Bakelungal chedelkelek Bakelungal cherou Molech Badelchelid Cheremrum Temetamel	Sea cucumbers	*Holithuria nobilis* *Hothothuria fuscogilva* *Holothuria scabra* *Actinopyga mauritiana* *Actinopyga miliaris* *Thelenota ananas*	No	Open	No export
	Sponges, hard corals, marine rock	*Porifera* sp. Scleratinia, Hydrocorallina, Coenothecailia, Stolnifera	No	Open	No export

Table 7: Fish Species Regulated by National Law

Palauan name	FAO common name	Scientific name	Minimum Size	Harvesting Season	Other restrictions
Meteunger el' 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	*Epinephelus fuscoguttatus* *Epinephelus polyphekadion* *Plectropomus areolatus* *Plectropomus laevis* *Plectropomus laevis* *Plectropomus leopardus*	No	Closed April 1 thru July 31	Illegal to buy or sell during closed season.
Meyas	Rabbitfish	*Siganus canaliculatus*	No	Closed March 1 thru May 31	Illegal to buy or sell during closed season
Berdebed, kemedukl	Humphead parrotfish	*Bolbometopon muricatum*	25 inches from beak to centre end of tail.	Open	No export whatever the size.
Ngimer; maml	Humphead wrasse (also known as Napoleon Wrasse)	*Chelinus undulatus*	No harvesting at all	Closed	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.

Table 8: National Regulations for Turtle Harvest

Green Turtle (Melob)	34 in (81cm) carapace length	Closed June thru August & Dec thru Jan.	No taking of eggs, no taking of female while she is on shore.
Hawksbill turtle (Ngasech)	27 in (69 cm) carapace length.	Closed June thru August & Dec thru Jan.	No taking of eggs, no taking of female while she is on shore.

8.4 Environmental Quality & Protection Board

What is EQPB?
The EQPB is responsible for protecting and preserving the environment for all its citizens. Any major environmental changes must be reported to their office. The types of environmental changes that EQPB handles affect the tourist industry. EQPB is funded by the EPA. Public participation in all areas of this task including compliance, monitoring, and enforcement is essential.

Major areas of concern:
1. Water Quality – EQPB regularly tests marine and drinking water quality in all states. Public announcements issued over the radio if drinking water in Koror and/or Airai is not safe. Advise all tourists not to drink water straight from the tap – unless boiled first!

2. Earthmoving Activity – any construction or other activity which disturbs or alters the surface of the land, a coral reef or bottom of a lagoon, (including but not limited to, excavation, dredging, embankments, and reclamation on a lagoon, land development, subdivision development, mineral excavation including sand, ocean disposal, and moving, and depositing or storing soil, rock or earth.)
    a. any activity of this kind requires a permit from EQPB
    b. Mooring buoys need a permit
    c. Civil penalties can be up to $10,000/day
    d. Earthmoving activities can have devastating impacts, short and long term, on water quality as well as ecosystems

3. Solid Waste – Solid waste must disposed of in an approved facility
    a. Civil penalties for littering/illegal disposal of solid waste – up to $10,000/day
    b. If it is your vessel and clients throw trash overboard, you as well as the tourists are responsible for violating Palau Solid Waste Regulations

4. Pesticides and Hazardous Materials
    a. Oil and Batteries are extremely damaging to marine environments and should never be disposed of in any of our waters.
        1. dispose of batteries in solid waste disposal facility
        2. Penalties – can be up to $10,000/violation
    b. Pesticides and Common Household Cleaning Products can also be damaging.
        1. phosphates encourage growth of algae
        2. surfactants bind to fish gills
        3. bleach, in high concentrations, kills everything including corals
        4. Use eco-friendly alternatives which can also be less expensive!

5. Sewage discharge – All point source discharge requires a permit from EQPB.
    a. All marine vessels with toilet facilities are required to have a Marine Sanitation Device. Enforceable by US Coast Guard.
    b. Port a Potties can also be used if used appropriately
    c. Raw sewage is potentially dangerous because of high bacteria doses and disease-causing organisms
    d. Penalties – up to $10,000/violation

Other Important Environmental Regulations

A. It is illegal to "harass, harm, kill, pursue, collect, or possess any plant/animal that is endangered/threatened. Penalties = $10,000 and/or 1 yr. in prison

B. It is illegal to take turtles under the following circumstances:
1. a turtle is on shore
2. the shell is less than 27 inches (69cm) for Hawksbill turtles or less than 34 inches (86cm) for green turtles
3. during the months of December, January, June, July, and August
4. no turtle eggs are to be taken at any time!

Penalties = 6 months in jail /$100 fine

C. It is illegal to take sponges. Penalties = 6 months/$100

D. It is illegal to take Black Lip Mother of Pearl Oyster shells which are less than 4" across and any time during August 1 – December 31. Penalties = 6mo/$100

E. Trochus: Only Palauan citizens can take! Must be more than 3" across base. Clam meat – export is prohibited

F. Ngerukewid Islands Preserve. Do not go there at any time without permission from the Chief of Conservation and Entomology! Penalties = 6months in jail/$50 fine and All Equipment
Will Be Confiscated (including boat).

G. Fishing
- Illegal commercial fishing including, but not limited to: temekai, maml, meas, cheraprukl
- Illegal fishing while using underwater breathing apparatus other than a snorkel
- Illegal commercial exportation of including, but not limited too: ketat, chemang, cheraprukl, maml, cheremrum.
- Illegal use of gill net with mesh size less than 3" diagonally, use and possession of kesokes net with mesh size less than 3" diagonally.
- Illegal taking of fish for aquarium use without proper permit

EQPB Recommendations
1. Advise tourists not to drink water straight from the tap at any time
2. Advise tourists not to take, manipulate, or interfere with any part of Palau's natural environment. They are here as guests and therefore should treat every element of our environment respectfully, as they would entering a friend or neighbor's home.
3. BE A GOOD EXAMPLE AS A LAW ABIDING CITIZEN COMMITTED TO PRESERVING THE QUALITY OF OUR ENVIRONMENT. Set a strict behavioral standard for clients. Out of this will come respect and admiration. Tourists will appreciate and be aware of Palau's uniqueness.
4. Share your knowledge of environmental regulations in Palau, why they are important, and your personal commitment.
5. Report any noticeable changes in the environment immediately.
6. Report any violations immediately.
7. Public participation in "preserving and protecting the quality of Palau's natural

environment" will become especially crucial following implementation of the Compact, due to loss of much U.S. Federal oversight. It will become completely up to the people of Palau to protect the rich, unique, natural beauty, and quality of our home.

MARINE AND FRESH WATER QUALITY REGULATIONS
GENERAL PROVISIONS

2401-11-01 Authority

These regulations are promulgated by the Republic of Palau Environmental Quality Protection Board pursuant to the authority granted it by Title 24 of the Palau National Code. These regulations shall have the force and effect of law and shall be binding on all persons and other entities subject to the jurisdiction of the Republic of Palau. The Board shall apply these regulations to all marine and fresh water bodies in the Republic of Palau. (Effective May 26, 1996)

2401-11-02 Purpose

It is the purpose of these regulations to:

(A) Identify the uses for which the various waters of the Republic of Palau shall be maintained and protected.

(B) Specify the water quality standards required to maintain the designated uses.

(C) Prescribe regulations necessary for implementing, achieving, and maintaining the specified water quality, and to protect health, welfare and property, and to assure that no pollutants are discharged into these waters without being given the degree of treatment or control necessary to prevent pollution. (Effective May 26, 1996)

2401-11-03 Policy

It is the policy of the Republic of Palau that:

(A) The maintenance of water quality that will provide for the propagation of aquatic life and for recreation in and on the water is an historical and legitimate right of the people of the Republic of Palau.

(B) The achievement of the water quality goals of the Republic of Palau is in the public interest and should not represent an unreasonable barrier to economic or social development.

(C) Existing water uses and the level of water quality necessary to protect existing uses shall be maintained and protected. No further water quality degradation, which would interfere with or become injurious to these existing uses is allowable. Existing uses are those actually attained in the water body on or after November 28, 1975, whether or not they are included in the water quality standards.

(D) Waters whose existing quality is less than the quality specified by these standards shall be improved to comply with these standards.

(E) Waters whose existing quality exceeds levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water shall be maintained and protected unless and until the Board finds, after full opportunity for public participation and intergovernmental coordination, that allowing lower water quality is necessary to accommodate an important economic or social development in the area in which the waters are located. In no event, however, may degradation of water quality interfere with or become injurious to existing uses. Implementation of this policy shall be in accordance with Title 24 of the Palau National Code and the rules and regulations promulgated there under. [See also: Sections 2401-11-09(B)(6) and 2401-11-20(C)]

(F) Before any new point source of pollution is allowed to lower the quality of water, the source shall be required to meet and maintain the highest statutory and regulatory requirements. Before a non-point source is allowed to lower the water quality, the source shall establish and use the best, most cost-effective, and reasonable management practices.
(G) To the extent practicable, all new point sources of pollution shall not discharge into near-shore or fresh surface waters.
(H) There shall be no direct or indirect discharge of sewage or other waste into any planned or intended ground or surface source of drinking water.
(I) All sewage and waste shall receive the degree of treatment necessary to protect the beneficial uses of waters of the Republic of Palau before discharge.
(J) In no event shall there be a degradation of water quality which shall cause the water quality to fall below that necessary to protect the uses of the water for the propagation of aquatic life and for recreation in and on the water.
(K) Outstanding national resource waters shall be protected in a pristine state.
(Effective May 26, 1996)

2401-11-04 Definitions

(A) "Board" or "EQPB" means the Republic of Palau Environmental Quality Protection Board or its authorized representative.
(B) “Buffer Zone” shall mean a strip of land in permanent vegetation adjacent to State waters or waters of Palau, designed to intercept pollutants, control erosion and manage other environmental concerns.*
(C) "Chairman" means the Chairman of the Republic of Palau Environmental Quality Protection Board personally or his authorized representative.
(D) "Coastal Waters" means "near-shore waters", "off-shore waters" and those brackish, fresh, and salt waters that are subject to ebb and flow of the tide.
(E) "Dilution Ratio" as used in Section 2401-11-32(A)(6) is the ratio of entrained water to quantity of discharged water at the plume centerline after initial dilution.
(F) “Freshwater Lake” shall mean any body of fresh water that has permanent open water with a surface area that is more than an quarter of an acre, excluding man-made ornamental lakes or ponds and all types of pollution treatment lagoons.*
(G) "Groundwater" means any and all water found beneath the earth whether in confined or unconfined areas.
H) “High Tide Line” shall mean the line delineating the maximum height reached by the rising tide on a periodic basis, excluding unexpected variations in the high tide line resulting from storm surges. In the absence of actual data, the high tide line shall be determined by the deposit of debris on the shore, other physical markings or characteristics, vegetation lines, tidal gauges or other suitable means.*
(I) "Initial Dilution" means the dilution that the wastewater has achieved with the receiving water at the centerline of the mixing zone as defined in Division I below where the mixture surfaces or the density of the mixture becomes equal to the density of the surrounding receiving water. The "initial dilution" may be calculated by using the procedure in Users Guide and Documentation for Outfall Plume Model D.J. Baumgartner. D.S. Trent and K.V. Byram, Working Paper #80, EPA, Pacific Northwest Water Laboratory May 1971. (Available by writing National Technical Information Service 5285 Port Royal Road, Springfield, Virginia 22151, Order Number NTISPB 204-557)
(J) "License" or "Permit" means any license or permit granted by an agency of the National Government to conduct any activity which may result in any discharge into the waters of the Republic of Palau.

(K) "Licensing or Permitting Agency" means any agency of the National Government to which application is made for a license or permit and which has the authority to issue a license or permit.
(L) “Mangroves” shall mean forested areas where the soils are tidally flooded with seawater or a mixture of fresh water and seawater.*
(M) "Mixing Zone" means a defined area around a point source in which specific water quality criteria may be revised in accordance with Sections 2401-11-30 through 2401-11-36, inclusive of these regulations. A zone of mixing is the volume of water near the point of discharge within which the waste immediately mixes with ocean water due to the momentum of the waste discharge and the difference in density between the waste and the receiving
(N) "Natural" means free of substances or conditions or a combination of both attributable to human activities.
(O) "Natural Condition" or "Naturally Occurring" means that state of water quality that would exist at a specified time and place in the absence of human activities.
(P) "Near-Shore Waters" means those salt waters lying within a defined reef area, or those salt waters up to 1,000 feet off-shore where there is no defined reef area.
(Q) "Non-Point Source" means any origin from which pollutants emanate in an unconfined and un-channeled 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 occurs 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 habitants or other resources be permitted.
(4) The classification of any water areas as Class AA shall not prelude 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)*

2401-11-19 Toxic Substances

Marine and fresh water standards for toxic substances are set forth in Appendix A to the 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 accumulation of 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. (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:

$$Cf = \frac{C_c + C_b (D_x)}{(D_x + 1)}$$

C = Concentration after mixing
fCc = Effluent concentration (instantaneous maximum)
Cb = Background concentration
Dx = 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 no 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 to be 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 (365 meters) N.W. of the Nikko pier and an additional 300 feet (91 meters) 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
(b) Beach south of Pkulagelul (Bkulengeluul) point
(c) 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)*

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 certification and/or permit for which certification is sought. (Effective May 26, 1996)

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 affect 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)*

Permit Guide

Marine and Freshwater Discharge Permit

The purpose of this permit is to ensure that no pollutants are discharged into the waters of Palau without being given the degree of treatment or control necessary to prevent pollution or any reduction of water quality. Pollutants covered include dredged spoils (this does not refer to filling of wetlands with dredged materials, which is covered by earth moving regulations and permit and U.S. Army Corps of Engineer permit), solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, and industrial, municipal, and agricultural waste. Any project which may represent a new or increased course of pollution is required to obtain a permit. Examples of discharging facilities are municipal sewage treatment plants, industrial facilities, and commercial facilities. The EQPB office will require conditions on the construction and/or operation of the project to mitigate or eliminate any adverse water quality impacts associated with the project.

ROP water quality rules and regulations establish specific criteria and policy for clean water standards. This includes maximum allowable concentrations of specific pollutants, and where each criteria applies in the waters of Palau.

Information required on the application includes location, method, and flow chart of discharge, a list of pollutants and estimated quantities to be discharged, methods of waste treatment to be employed and waste treatment by product disposal, and evidence that the concentration of toxic substances present in the discharge will not violate water quality standards for toxic substances.

8.5 Managing Boat Wastes

This section outlines some basic do and don't practice guidelines for managing boat wastes.

Bilge Water
Once in the marine environment, oil and fuels can collect in the bottom sediments and concentrate in marine organisms. These substances often enter the marine environment through bilge pumping, fueling, and improper response to spills.
DO:

- ✓ Fix small leaks that allow oil to drip into the bilge
- ✓ Take extra care when you change your oil
- ✓ Use oil-absorbent pads to capture surface oil. Make sure oil is completely absorbed.
- ✓ Dispose of used pads in trash.
- ✓ Raise the bilge pump automatic float switch enough to keep any oil contaminated bilge water aboard until it can be pumped to a clean container.

DON'T:

- o Drain engine oil into the bilge
- o Put off repairs to engine and fuel tank leaks
- o Disable automatic bilge pumps while doing engine repairs
- o Turn on bilge pumps before ensuring that the bilge is clean
- o Dispose of used oil except at an approved waste reception facility
- o Use dispersants such as dish soaps – they do not remove oil form the water, they only break it down into small, hard to see drops
- o Discharge bilge water if there is a sheen to it

Boat and Deck Washing
Every time we wash our decks with soap, we contribute to water pollution. Many soaps contain phosphates which promote the growth of algae which extract oxygen from the water which is essential to fish populations.
DO:

- ✓ Rinse and scrub your boat with a brush after each use; safest cleaning product is good old fashioned "elbow grease"
- ✓ Try to buy alternative products that do not contain phosphates
- ✓ Use non-toxic biodegradable cleaners
- ✓ Use hose nozzles that shut off when released and conserve water and reduce the runoff from boat washing

DON"T:

- o Use cleaners that contain ammonia, sodium, chlorinated solvents, petroleum distillates, or lye
- o Clean the bottom of your vessel by scrapping or scrubbing it while it is still in the water

Marine Debris
The ocean is not a dump! Marine debris – plastic, nets, fishing lines, six pack rings, styrofoam, etc. – can kill marine life.

DO:

- ✓ Keep all waste on board in proper receptacles. Separate plastics, cans, and glass for recycling. Properly manage your debris so that it will not be blown or washed overboard
- ✓ Avoid expensive boat engine repairs – keep your trash out of the water! Boat engines can be damaged when propellers or cooling water intakes become entangled with nets and other marine debris
- ✓ Choose reusable items rather than disposables

DON'T:

- o Discard any garbage overboard
- o Discard any plastic over the side

Paints, Varnishes, and Epoxies, etc.

Water-soluble paints are less dangerous. The growth of marine organisms on hulls is a common problem faced by boaters. Many boat paints are designed to slough off and carry away unwanted growth. These same paints can often contain anti-growth toxins, which when leached into the water, can accumulate back to us in the fish that we eat.

DO:

- ✓ Buy only what you need. Mix only what you need. Prepare paints over a drop cloth on land, not on the dock.
- ✓ Use the most environmentally friendly bottom paints available.
- ✓ Scrape and paint your boat away from the water. Plug the scuppers and wipe up any spills or residues.
- ✓ Use drop cloths, pans, contaminated trays, etc. to catch paint scrapings and drippings. Dispose of wastes in the trash. Allow empty paint cans to dry out before throwing them away.
- ✓ Scrub the hull periodically to extend the useful life of the paint.

DON"T:

- o Scrub the hull periodically to try to extend the useful life of the paint while in the water.

Used Oil

If improperly managed, used oil is a dangerous pollutant. Just one quart of oil can contaminate 250,000 gallons of water and can injure fish, birds, and other aquatic life.

DO:

- ✓ Store your oil in a clean, air tight container
- ✓ Use oil absorbent products to contain any accidental spills or when you change your oil
- ✓ Bring your uncontaminated used oil to a collection facility or recycling center.

DON"T:

- o Mix used oil with solvents, thinner, paint, anti-freeze, fuel or other hazardous substances.

Information Source: Environmental Quality Protection Board (EQPB), Office.

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