Republic of Palau Fifth National Report to the Convention on Biological Diversity

2014

Koror Rock Island Southern Lagoon

Office of the Environment, Response and Coordination (OERC)
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Executive Summary

The Palau Islands, located in Western Micronesia, contain some of the most diverse and pristine ecosystems in the world. These diverse habitats are home to an extraordinarily high number of marine and terrestrial species that are essential to the culture, economy and livelihoods of the Palauan people. Many species and ecosystems are endemic or rare and conserving Palau's resources is important globally.

Palau's efforts to conserve its biodiversity and manage its natural resources are greatly aided by the fact that there is an enabling environment for biodiversity conservation. Since the drafting of Palau's NBSAP (2005) almost 10 years ago, biodiversity conservation in general and community-based conservation activities in particular have grown considerably in Palau. Local communities have designated protected areas throughout the country in order to protect species and sites important to them. The number of these protected areas in Palau has more than doubled in the past 10 years. A national framework for protected areas now exists in Palau: the Palau Protected Areas Network (PAN). PAN's goal is to provide national level support for protected area management activities at the local level. Protected areas are recognized at the regional and international level through the Micronesia Challenge.

Additionally, there are more organizations involved in conservation and resource management than there were 10 years ago. Many of the groups and people working on conservation in Palau recognize the importance of sharing limited human and other resources and often work in collaborative partnerships. Some of these partnerships aim to improve resource management by integrating activities among a variety of organizations.

This Fifth National Report describes the existing context of Palau's biodiversity and outlines the current and proposed actions needed to ensure the successful conservation and management of that biodiversity.

PART I: ASSESSING THE STATUS, TRENDS AND THREATS OF BIODIVERSITY AND IMPLICATIONS FOR HUMAN WELL-BEING

1.0 INTRODUCTION

The Republic of Palau is a Small Island Developing State (SIDS) located in the tropical north Pacific. The main island group lies approximately 800 km north of New Guinea and 800 km east of the Philippines. Only 9 of the more than 340 islands which make up the country are inhabited. The inhabited islands are: Angaur, Babeldaob, Hatohobei, Helen Reef, Kayangel, Koror, Peleliu, Pulo Anna, and Sonsorol. Palau has a total land area of approximately 490 km^2, and a total marine area of approximately 616,000 km^2. Palau is divided into 16 states, including 10 states on the island of Babeldaob. Babeldaob is the largest island with more than 80% of the total land area of the country. Approximately 70% of the population is concentrated in Koror state and Airai state, which is located at the southern end of Babeldaob.

Beginning in the late 19^{th} century, Palau has experienced several waves of foreign political control, most recently as part of the U.S. Trust Territory of the Pacific Islands following World War II. The nation gained independence in 1994 after the adoption of the Compact of Free Association (COFA) with the United States. The Compact Agreement is a major source of revenue for the national government and also provides for ongoing technical and material assistance throughout the nation. In the years since the creation of the Palau National Biodiversity Strategy and Action Plan (NBSAP), the Compact Road, a national highway encircling the island of Babeldaob has been completed. The Compact Road has significantly altered internal travel and opened the way to greater development potential throughout Babeldaob. Following completion of the Compact Road, the national capitol was moved from Koror to Melekeok state on the central eastern coast of Babeldaob in order to encourage development on the big island.

In 1998, the Republic of Palau signed the United Nations Convention on Biological Diversity (UNCBD) which was adopted at the Earth Summit in Rio de Janeiro in 1992. Article 1 of the UNCBD set forth three objectives of the Convention:

- The conservation of biodiversity;
- The sustainable use of its components; and
- The fair and equitable sharing of benefits of the utilization of genetic resources.

Palau completed its first National Biodiversity Strategy and Action Plan in 2004 (NBSAP, 2004). The NBSAP provided a description of the state of biodiversity and its importance to Palau, as well as conditions affecting management of those resources. Following consultations with national, state and local governments, non-government organizations and the private sector, the NBSAP was developed around eight thematic areas. The themes of the NBSAP were intended to provide a focus for plan objectives in order to build capacity, promote sustainable development and improve biodiversity management. The themes of the NBSAP are:

1. Protected/Managed Areas
2. Species Protection

3. Biosecurity – Invasive Species and Biosafety
4. Sharing Benefits of Genetic Resources
5. Sustainable Economic Development
6. Prevent or Minimize Waste
7. Agricultural Biodiversity
8. Mainstreaming of Biodiversity Conservation

Actions taken in support of the UNCBD have largely grown out of efforts to strengthen the legislative, regulatory and policy framework protecting Palau's environment as a whole. The protection of biodiversity has been a valuable motivator for driving the development of more effective resource management tools, as well as a point of engagement for improving public awareness of environmental issues in Palau. In order to build consensus, promote greater strategic coordination, and improve institutional capacity, the national government has continued to work closely with state and local governments, traditional leaders, and civil society, including NGOs and the private sector.

In 2010, the initial UNCBD goals were revisited and expanded by the Parties to the Convention on Biological Diversity in Nagoya, Japan. The Aichi Biodiversity Goals are:

1. Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society;
2. Reduce the direct pressures on biodiversity and promote sustainable use;
3. Improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity;
4. Enhance the benefits to all from biodiversity and ecosystem services; and
5. Enhance implementation through participatory planning, knowledge management and capacity building. (Aichi, 2010)

In response to the shift in focus toward community engagement set forth by the Aichi Goals, the national government began emphasizing state- and community-level conservation actions. As a result of improved institutional capacity built through working toward the initial UNCBD goals, the national government has been able to provide technical support to state agencies and local organizations in planning and implementing community-based initiatives.

Lessons learned during the last decade suggest that such community-based initiatives are effective in improving public support for and commitment to conservation goals, ultimately increasing the long-term sustainability of management actions (PCS, 2013). Monitoring and data collection continue to be persistent challenges throughout Palau. As a result, community members' often extensive anecdotal knowledge of local environmental conditions can be valuable in bridging some information gaps. Including traditional leaders and community organizations in the planning process may also represent an alternative pathway for improving compliance with conservation initiatives by empowering traditional authority. Further, consideration of community economic development objectives is a key component of promoting sustainability and improving buy-in in Palauan communities.

1.1 METHODOLOGY

This Biodiversity and Stock Assessment (BSA) was developed following literature review and consultation with local experts and conservation managers during the months of December 2013 and January and February of 2014. Contributors were asked to review the status of biodiversity in Palau, assess the legal, regulatory, and policy frameworks currently in place, and identify gaps or other areas that could be targeted for future action. Information in this BSA is drawn substantially from other state and national assessments, completed conservation action plans and personal correspondence with local subject area experts.

1.2 OVERVIEW OF CURRENT CONDITIONS AFFECTING BIODIVERSITY

In the years since the NBSAP was created, Palau has put considerable effort into improving natural resource management at all levels of society, from national legislation to community-driven initiatives. Taking into consideration the limited resources available, these actions have typically been designed to address multiple issues at once. Palau is facing a number of developmental and environmental challenges that are likely to impact biodiversity. The causes of and relationships between these issues are complex, but can generally be grouped into several primary issues:

1. Climate Change
2. Economic Development
3. Population Growth and Urbanization
4. Water Quality and Quantity
5. Conservation and Protection
6. Sustainable Use
7. Cultural Preservation
8. Data Gaps

1.2.1 Climate Change

SIDS like Palau are particularly susceptible to ecological disturbances related to global climate change. Climate change impacts affect both marine and terrestrial ecosystems and the organisms that depend on them. Climate change contributes to increased seawater temperature, increased air temperature, sea level rise, climate extremes, and changes in weather and precipitation patterns. These factors resulting from climate change lead to ecosystem level impacts that can directly affect biodiversity.

Past extreme climate events have demonstrated Palau's susceptibility to the effects of climate change. An El Niño event in 1998 led to significant ecosystem damage in both marine and terrestrial environments in Palau. Elevated seawater temperatures contributed to massive coral bleaching and decline of sea life in near shore areas. Some areas have yet to recover fully from the event. At the peak of the El Niño during the month of March 1998, Palau received the lowest amount of rainfall in over 100 years of records. The resulting drought led to depletion of water supplies, crop failures, and uncontrolled wildfires on some islands. (ADB, 2007)

Although Palau is generally considered outside of the typhoon belt, the country has been hit by two major typhoons in the last two years. In December 2012 Palau was hit by Typhoon Bopha

and in November 2013 by Typhoon Haiyan. Both typhoons went on to cause substantial death and destruction in the Philippines. In Palau these typhoons caused significant wind damage to homes and trees, storm surge flooding in coastal areas, heavy rains, and alterations in lagoon channels. Typhoon Haiyan caused particularly severe damage in Kayangel state. Nearly all structures in the state were destroyed, the vast majority of trees were toppled by high winds, taro patches were inundated with seawater, and the drinking water supply was contaminated with saltwater. As a result of damage to the state, all residents have been evacuated.

Table 1: Climate Change Effects, Implications, and Possible Impact on Biodiversity (adapted from Abujabal et al., 2009, ADB, 2009, and Kitalong 2010)

Effect	Implications	Possible Impacts on Biodiversity
Increased seawater temperature	• Coral bleaching • Decline of fisheries	• Loss of coral species, organisms dependent on corals • Habitat loss • Fish nursery decline
Increased average air and ocean temperatures	• Increased energy consumption • More severe weather events • Changes in water quality	• Destruction and alteration of habitat by storms • Coral bleaching • Import of petroleum to power air conditioning
Increase in sea-surface temperature	• Increased frequency and severity of tropical storms and typhoons	• Coral bleaching • Habitat loss due to storms
Sea level rise	• Flooding • Coastal erosion • Salt intrusion in taro fields • Damage to low-lying hamlets and infrastructure	• Loss of terrestrial habitat • Loss of agricultural area • Contamination of freshwater lenses
Climate extremes	• Droughts, storms and floods	• Increased susceptibility to invasive species
Changes in precipitation	• Decreased reliability of water supply	• Wild fires • Agricultural decline

1.2.2 Economic Development

Palau's economy is largely driven by foreign aid and tourism, with significant additional income generated through fishing. A 2012 International Monetary Fund report indicated that on average tourism accounts for 50% of Palau's GDP, and that foreign aid through the COFA and other grants accounts for an additional 25% of GDP. (IMF, 2012) In combination with its dependence

on imported food and fuel, the reliance on tourism and foreign aid leaves Palau vulnerable to global economic shifts. Given the country's small population base and limited economic activity, tax revenues in Palau are comparatively lower than in other nations in the region, leaving government agencies highly dependent on grant funds in order to function. In particular, state governments have very few options for raising revenue, leaving them dependent on yearly distributions of block grant funds from the national government. As a result of limited ability to raise revenues, regulatory and policy mandates may not receive adequate funding in order to be fully implemented.

Promoting private sector economic development is important to the long-term financial viability of the nation. However, increasing local economic development will by necessity require greater exploitation of Palau's natural resources, which may negatively impact biodiversity. The OEK has passed the National Petroleum Revenue Management and Sharing Act and the Petroleum Act opening the way for development of possible off-shore petroleum reserves in Palau's EEZ. (IMF, 2012) While petroleum development would diversify the national economy, it would also create a whole new set of environmental issues to be addressed. Current economic activities such as tourism and fishing also impact biodiversity. Tourists are drawn to Palau by extraordinary natural beauty and the abundance and diversity of wildlife. However, the number of visitors acts to effectively increase the demands on infrastructure, ecosystem services, and natural resources, including biological resources. Overfishing and the taking of undersized fish have led to anecdotal observations of general decline in the quality and quantity of catch size throughout Palau.

1.2.3 Population Growth and Urbanization

The National Action Plan to Combat Desertification identified land degradation due to population growth as the second greatest threat to sustainability in Palau. The plan identified nine major causes of land degradation in Palau (ADB, 2007):

1. Lack of land use planning
2. Development following completion of the Compact Road
3. Drought
4. Sea-level rise
5. Loss of soil fertility
6. Watershed degradation
7. Invasive Species
8. Uncontrolled fires
9. Unsustainable development practices

Population growth contributes to increased pressure on ecological systems by raising the demand for natural resources and by driving development of land and water areas. Urbanization represents a shift from traditional fishing and agricultural values toward greater reliance on new technology and imported materials in order to meet the needs of a growing population. Until a mini-census completed in 2012, following World War II the national population had consistently increased at each measurement. Bucking historical trends, from the previous census in 2005, the 2012 census indicated that total population declined from 19,907 to 17,501, a decrease of over 12%. (OPS, 2012) It is likely that the population decline is primarily the result of emigration as

residents seek economic opportunities elsewhere. While the total population of residents has declined, the number of visitors has increased since 2005, with an estimated 100,000 visitors per year in 2011. (IMF, 2012)

Population has also continued to remain largely concentrated in the Koror/Airai region, resulting in greater infrastructure development and stress on ecosystems in those areas. Airai in particular has experienced significant development along with a 75% increase in population in the last 25 years. (Kitalong, 2010) Since the early 1980's, major development in Airai has included construction of the airport, portions of the Compact Road and service roads, commercial agricultural operations, and construction of large housing developments. These activities coincided with loss of forested areas, including upland and mangrove forest areas, increased erosion in Airai's watersheds, and elevated sedimentation in marine waters fed by associated watersheds. The loss of ecosystem services in Airai's watersheds provided by biological components represents a serious threat to both human activity and biodiversity in the area. The Ngerikiil Watershed is the primary source of drinking water for approximately 75% of the population of the country, and includes areas that have undergone major development. The Ngerikiil River empties into Airai Bay. As a result of increased sediment loads and decreased capacity for natural features such as mangrove forests to filter suspended particles, the reefs in Airai bay have been smothered, and the once productive fishery has collapsed. (PCS, 2013)

Koror remains the economic center of Palau, even after completion of the Compact Road and relocation of the national capital to Ngerelmuud hamlet in Melekeok state. Rather than relocating to Melekeok or other nearby states, many lawmakers and government workers simply commute from their homes in Koror and Airai to work. Greater economic development in the Melekeok area will be required in order to promote relocation to the state. While relocation of the national capital has not yet stimulated large scale population movement that might reduce development pressure in the Koror/Airai region, the centralization of the economy has had unintended benefits for biodiversity in other regions in Palau. Babeldaob is sparsely inhabited compared to the Koror/Airai region. As a result, significant areas of Palau's forests are relatively untouched, leaving large terrestrial and marine areas available for designation as protected areas.

Beyond simple population increase, Palau has become increasingly urbanized with the majority of the national population residing in the urban Koror/Airai region. Further, the high standard of living enjoyed by the people of Palau has led to increased consumption of foreign goods and adoption of new technologies in all aspects of society. Greater consumption of foreign goods has increased the amount of solid, non-compostable waste produced, pushing the boundaries of the nation's capacity to deal with waste. When applied to traditional industries such as fishing, new technology like motorboats and more efficient fishing equipment has improved the capacity of local fishermen to catch fish. However, improved efficiency and intensity of fishing may allow fishermen to outstrip the capacity of fisheries to support the industry.

1.2.4 Water Quality and Quantity

Overall, Palau receives abundant rainfall throughout the year and water quality is generally high. However, water storage and distribution is an ongoing challenge. Per capita, Palau has a high rate of water consumption compared to other countries. (PCS, 2013) With approximately 75% of the population relying on one watershed, the Ngerikiil, the freshwater supply is highly sensitive

to declines in water quality or quantity. During periods of drought, water blackouts are sometimes employed in the Koror/Airai region. Blackouts serve a dual purpose—reduction of consumption during certain times and a method for identification of leaks in the distribution system. Blackouts are only a stopgap measure; eventually additional water storage capacity will be required.

As mentioned in section 1.2.1 above, droughts in Palau can be sudden and severe. Diversion of water to meet human needs during droughts can lead to decreased flows, which may potentially interfere with the lifecycles of aquatic organisms. Considering the agriculture sector's reliance on rainfall for water, without irrigation systems in place, it is difficult for farmers to sustain crops through droughts. Drought conditions increase the danger of fire, particularly in open savanna areas, which are often subjected to deliberately set fires. Palau currently lacks sufficient infrastructure and resources to effectively respond to most wilderness fires, meaning that uncontrolled fires are left to burn out on their own. Forests abutting savanna areas that are subjected to frequent fires are whittled away over time by repeated exposure to fire along the edges. (Kitalong, 2010) Due to Palau's generally highly weathered acidic soils, vegetation in burn areas is slow to recover. Burn areas are left at a greater risk of erosion and impairment of water quality in associated bodies of water.

Water quality has also been affected by agricultural development. Downstream from large-scale piggeries, water samples have shown elevated levels of coliform bacteria. The presence of coliforms indicates contamination from animal waste. Although the current scale of use is unknown, use of chemical fertilizers and pesticides may contribute to contamination of agricultural runoff, further impacting biodiversity in aquatic and marine environments. In addition, with increased urbanization and consumption of foreign goods, untreated effluent containing detergents may contribute to excess nutrients in aquatic and marine systems, potentially leading to eutrophication. (PCS, 2013)

1.2.5 Conservation and Protection

Palau has had great success in enacting legislation to protect ecosystems and biodiversity as well as designate conservation areas. Already recognized as the world's first shark sanctuary, President Tommy Remengesau has recently proposed that Palau become a marine sanctuary, which would lead to greater protection of the country's fisheries. Other notable conservation and protection successes include ongoing maintenance and expansion of the Protected Areas Network (PAN), designation of the Koror State Rock Islands Southern Lagoon as a UNESCO World Heritage Site, designation of the Ngardok Nature Reserve as a RAMSAR site, and recognition of the Ngermeduu Biosphere for its enormous importance to biodiversity.

In addition to designating conservation areas, Palau has made progress in improving planning capacity and overall management of its natural resources. Airai and Melekeok states have been leaders in developing management plans including Master and Land Use Plans and in 2013, Airai state completed the first state-level watershed management plan in Palau. These plans have included sections addressing management of individual species as well as general issues related to conservation of biodiversity.

Palau is home to hundreds of known endemic marine and terrestrial species, likely with many

more species that have yet to be described by science. In 2011 a new species of marine eel, *Protanguilla palau*, was discovered in the rock islands of Palau. The eel species was discovered in a cave on Ngemelis island, a popular tourist destination. The species is a living fossil, representing a previously unknown family of eels and demonstrating characteristics of early eel evolution. Such discoveries underscore the need for further study and conservation of Palau's biological resources.

Considering the lack of quantitative data and monitoring capacity for many environmental processes and species in Palau, effort has been made to identify qualitative indicators of ecosystem health. It is hoped that using qualitative indicators can be used to improve environmental until local capacity for qualitative data collection and management improves. Some progress has been made in improving understanding of possible indicators of ecosystem health. The Belau National Museum, in cooperation with the Palau Conservation Society and the Palau International Coral Reef Center, has completed preliminary studies to identify bird species that can be used to indicate near shore environmental quality. More research and analysis is needed to improve understanding of the conservation needs facing Palau as well as to improve the ability to monitor and analyze the outcomes of conservation initiatives.

1.2.6 Sustainable Use

Sustainable development and use of natural resources has been another major focus of policy and planning design. Sustainable use represents an approach to conservation that allows for the controlled use of resources in ways that do not exceed environmental capacity. Since the creation of the NBSAP, the country has made progress in developing both national and state level policies to promote sustainable use across development sectors. In order to increase funding for environmental management, the country has instituted a $30 Green Fee that visitors to Palau must pay before leaving Palau. Money collected through the Green Fee supports the Protected Areas Network (PAN). Other national-level initiatives include Palau's participation in the Micronesia Challenge, a regional agreement intended to support environmental conservation, protection of biodiversity, sustainable development and climate change preparedness throughout Micronesia. A national recycling program has also been implemented in order to reduce the amount of non-compostable solid waste entering Palau's landfills.

State-level and protected area-specific management plans have been implemented across Palau. In general, these plans are designed to allow for long-term sustainable use of the resources, ecosystem services and biodiversity that falls within the scope of the management plan. Taking into consideration the economic needs of managed areas, their ongoing importance to tourism, agriculture and other industries, and the intrinsic value of biological resources, management plans have been designed to promote implementation of best management practices (BMPs) as a method for achieving sustainability. BMPs include both generally accepted management solutions as well as Palau-specific practices based on traditional knowledge of the local environment.

While progress has been made in improving sustainable management in Palau, there is much work still to be done. National guidelines need to be established for developing state and protected area-specific management plans. While some states have created land and water management plans, and some protected areas have implemented management plans, in order to

provide for consistent and adequate protection across political boundaries, all states and management areas need to establish comprehensive management plans. Since the NBSAP was created, institutional and human resource capacity has improved. Provided adequate funding support during the planning stage, it is likely that sufficient local expertise exists to meet the demands of developing management plans. Ongoing capacity development will still be necessary to adequately implement and enforce these management plans.

1.2.7 Cultural Preservation

Palauan culture is deeply linked to the environment. Palauan legends are filled with references to the importance of plants and animals in providing for the needs of the Palauan people. Medicinal plants and certain prized species of animals play important roles in traditional customs; timber is used for firewood, construction and carving; and activities like taro cultivation, fishing and collection of marine invertebrates are still significant sources of food and income for many Palauan families. The long history of human habitation in Palau combined with the generally high quality of the environment and the impressive diversity of biological resources provides a testament to the effectiveness of traditional management practices. Prior to significant influence from foreign powers, it is estimated that Palau supported a maximum population of as many as 80,000 people. Considering the current population and contribution of resources from outside sources, it is likely that with proper management strategies, Palau could establish sustainable industries that would allow for ongoing environmental health while also supporting economic development needs.

While Palauan culture in general prizes a high quality environment, some cultural practices coupled with improved technology have contributed to declines in biodiversity. Pressures on Palau's coastal resources arise not only from large-scale phenomenon such as elevated ocean temperatures and coral bleaching, but also from local-scale activities such as overfishing and tourism overuse. People are now collecting resources, especially in the marine environment, with new and more effective gear. Traditional methods that tended to limit the harvest are rarely employed as methods for hunting and fishing. In addition people are increasingly collecting or harvesting resources for monetary income rather than solely for local subsistence uses. In addition, projects such as road building, mangrove filling, and dredging are altering habitats in many areas to such a degree that once abundant marine species are now hard to find. Taro patches are also not as productive as they once were. (ADB, 2007)

Traditional values continue to play an important role in Palauan society. A council of traditional chiefs' function as advisors to the president, and councils of chiefs and other traditional organizations still wield authority at various levels in society. There is significant potential for merging traditional and modern practices into management policies that are well suited to meet the specific development and conservation needs of Palau.

1.2.8 Data Gaps

Across all sectors, the lack of quantitative data and analysis is a major hindrance to developing effective policies and monitoring any effects that management programs may produce. Without more and better data and data analysis, agencies are severely limited in their ability to design, implement, and monitor the effectiveness of environmental policies. Anecdotal observations made by fishermen and other individuals with regular interaction with the environment provide

valuable information for shaping policy decisions, but systematic, quantitative data is necessary to improve the quality of environmental management. Some progress has been made in filling in some data gaps through research supported by partnerships between government, NGOs and the private sector. However, considerable capacity development is needed in order to establish and maintain ongoing data collection, monitoring, reporting and analysis systems.

1.3 STATUS OF THE LEGISLATIVE AND REGULATORY FRAMEWORK

Legal authority in Palau is established through the Constitution of the Republic of Palau. The Olbiil er a Kelulau (OEK) is the premier body responsible for creating and promulgating national legislation. Ownership of marine resources is established in Article I, Section 2 of the Constitution, stating that each state "has exclusive ownership of all living and nonliving resources, except highly migratory fish, from the land to twelve nautical miles seaward of the baseline." (NBSAP, 2004) Land can be owned by individual Palauan citizens, clans, or by state and national governments, in which case lands are often administered by designated government agencies.

Currently, the majority of the States lack zoning regulations. Zoning is primarily a responsibility of each State. Airai state and Melekeok state have made progress toward creating effective zoning regulations through development of land use plans. While most States lack sufficient expertise and other necessary resources to complete comprehensive, long-term plans, there is a general willingness to take on more responsibility for land use planning and implementation. Planning Commissions could be created to share resources and facilitate the development of zoning and land use plans, including preparation and implementation of state zoning regulations and building codes that are consistent with national provisions. Zoning regulations are needed to ensure that developments are not detrimental to critical habitat areas. In addition, zoning may provide for a more uniform development structure, such as specifying residential, tourism and industrial areas. (ADB, 2007)

1.3.1 Natural Resource-related Legislation

While still a member of the Trust Territories of the Pacific Islands, Palau began to control its own internal governance in 1980. In 1981, the government passed the Environmental Quality Protection Act. This law established the Environmental Quality Protection Board (EQPB), mandating that EQPB be responsible for regulating earthmoving and development of structures, water quality, public water systems, solid waste management, toilet facilities, pesticides, environmental impact statements, and air pollution. (ADB, 2007) While the Environmental Quality Protection Act created EQPB and set forth its responsibilities, with few statutes to provide specific direction to management priorities, the EQPB was granted little authority to manage environmental consequences of development. (ADB, 2007) In addition, as established by the constitution, states have ownership of natural resources, which can further complicate the question of which body, the state government or EQPB, has authority over environmental management issues.

Since 1992, through legislation and traditional conservation practices, the states and traditional leaders have protected over 458 km^2 of natural reserves through a system of conservation areas, marine preserves, fish spawning areas, wildlife preserves, and sanctuaries. All ecosystems are

represented in these managed areas including more than 17% of all mangroves, the inner reef areas in eight states, two of the three atolls, twelve major channels or passes, and the two largest watersheds in Palau, including its only freshwater lake. (ADB, 2007)

In November 2003, the Republic of Palau passed legislation to establish a Palau Protected Areas Network (PAN). The PAN has led to improvements in managing natural resources by linking all of Palau's marine and terrestrial protected areas, coordinating efforts of many states in protecting Palau's ecosystems, and supporting local resource management issues by promoting cooperation between stakeholders. States also have access to assistance from the national government through the Ministry of Natural Resources and Environment. This includes technical assistance to states seeking to protect areas of significant biodiversity and unique habitats by allowing improved access to grant money and other management support programs. (ADB, 2007)

The term "protected" is defined in the legislation as "maintained, intact, preserved, conserved, or otherwise managed in a sustainable manner." Individual states are responsible for nominating areas within their borders to be eligible for the PAN network, applying for financial aid and technical support to manage the nominated areas, and developing and implementing management plans. Responsibilities of the national government include providing rules and regulations outlining the process for designating an area to become part of the PAN. It also assists with the enforcement of regulations and develops mechanisms for sustainable financing of the protected areas in PAN. The national government, through the MNRET is also responsible for standardizing the collection of information, record keeping, monitoring and reporting. (ADB, 2007)

Each State has a traditional system of resource management as well as legislation to manage their resources. The list below includes management plans but it is by no means an exhaustive list.

- Koror State Rock Islands Management Plan
- Management Plan for the Ngaremeduu Conservation Area
- Management Plan for the Ngardok Nature Reserve
- Ngeruangel Management Plan
- Helen Reef Surveillance and Deterrence Plan
- Melekeok State Land Use Plan
- Airai State Master and Land Use Plan
- 5-Year Airai State Watershed Management Plan

All of these management regimes have integrated legislation and traditional management into a management plan. Beyond creating management plans, the greatest challenge for most states is to effectively implement and enforce their management plans. (ADB, 2007)

Criminal and civil penalties have been established for individuals who violate regulations set forth for the protected areas. Many of the marine protected areas have restricted seasons for fishing and harvesting of certain species or have traditional moratoriums called *bul* in place. National and state governments are responsible for enforcing the regulations; however, Some of the states do not have full time conservation staff or enforcement officers and only one has a full time legal counsel. As a result, states have limited capacity to plan and implement programs and

continue to need technical assistance and further funding support from national government agencies and NGOs to effectively implement conservation programs. Lack of enforcement of conservation laws in general is also a problem in Palau due to enforcement agencies having human and institutional capacities to adequately enforce the laws. (ADB, 2007)

1.4 STATUS OF THE INSTITUTIONAL FRAMEWORK

Multiple national institutions contribute to environmental management and biodiversity protection, including government organizations, semi-government organizations and non-government organizations (NGO).

1.4.1 Government Organizations

Government organizations involved in management of Palau's biodiversity include:

Ministry of Natural Resources Environment and Tourism (MNRET)

MNRET is responsible for oversight of government initiated agricultural, forestry, fisheries and energy programs and activities. The Ministry is also responsible for all infrastructure maintenance and improvement at the national level, including road maintenance, sewer system operations and capital improvement projects. MRD includes:

- The Bureau of Lands and Surveys
- The Office of the Palau Automated Land and Resource Information System (PALARIS)
    - Provides mapping and geographic information systems services.
- The Palau Fisheries Advisory Committee
    - Provides recommendations to the Minister of Resources and Development and the President regarding national fisheries policies and implementation of the Palau National Tuna Fisheries Management Plan. (ADB, 2007)

Office of Environmental Response and Coordination (OERC)

OERC is responsible for ensuring compliance with Palau's obligations under the UN conventions on climate change, biodiversity, ozone, and desertification as well as facilitating coordination of national level responses to environmental degradation, protection, and rehabilitation of natural habitats. (ADB, 2007)

Ministry of Justice

The Ministry of Justice is responsible for overseeing the courts, law enforcement, and enforcing laws in Palau. The Bureau of Public Safety is the primary enforcement arm of the Ministry of Justice. Included in the Bureau of Public Safety are:

- The Division of Fish and Wildlife Protection (DFWP)
    - DFWP is the primary authority for enforcing criminal laws protecting the environment inside of the reef. DFWP also plays a role in community relations and education regarding environmental issues.
- The Division of Marine Law Enforcement (DMLE)
    - DMLE is the primary authority for enforcing foreign fishing laws, which largely concern marine areas outside of the reef. (ADB, 2007)

Palau Public Land Authority (PPLA)
PPLA administers, manages, and regulates the use of lands and any resulting income. It also establishes the basic guidelines and procedures for the operation of state public land authorities in each state, and provides technical assistance as appropriate. Each state in turn uses the authority granted to it by the PPLA to administer, manage and regulate public lands within its geographical boundaries. (ADB, 2007)

National Environmental Protection Council (NEPC)
NEPC is a is a high level policy council that focuses on improving coordination of environmental initiatives in order to ensure that Palau fulfills its obligations to international environmental agreements and treaties that have been ratified by the OEK. (ADB, 2007)

1.4.2 Semi-Government Organizations

Environmental Quality Protection Board (EQPB)
EQPB regulates all development activities involving earthmoving and structural development in Palau. The agency is also responsible for regulating environmental impact statements (EIS), marine and freshwater quality, air quality, public water systems, solid waste management, toilet facilities and pesticides. Major development projects are required to conduct an environmental assessment (EA). Depending on the scale of the project and its possible environmental impacts based on the initial EA, a full EIS may be required for projects that are likely to have significant negative impacts on the environment. (ADB, 2007)

Palau Community College Cooperative Research and Extension (PCC-CRE)
PCC-CRE programs mainly focus on agriculture and conservation of agricultural biodiversity resources. This agency is staffed with well-qualified agronomists and entomologists. The PCC-CRE Research and Development station in Ngaremlengui state has laboratory facilities for reproducing taro seedlings through tissue culture. They are also working on a germ plasm collection for varieties of banana, sweet potato and taro. As part of their comprehensive conservation management plan, they have planted hundreds of trees to serve as windbreaks and to stabilize soils in riparian areas. The trees also serve as educational displays for Outdoor Science Classes for local high school students. (ADB, 2007)

Palau International Coral Reef Center (PICRC)
PICRC is the result of a Common Agenda for Cooperation between Palau, Japan and the United States. The partnership was formed in order to address global issues related to health, population, environmental degradation and natural disasters. The Coral Reef Center itself was established by the Palau International Coral Reef Center Act of 1998. PICRC plays an important role in supporting coral reef studies, research and education, with the ongoing objectives of improving environmental management, sustainable use and conservation of Palau's marine resources. (ADB, 2007)

Palau Community Action Agency (PCAA)
The PCAA was established during the Trust Territory period under the U.S. Economic Opportunity Act of 1964. The PCAA is a nonprofit private and public organization intended to work toward reducing poverty and developing means for people to help themselves gain self-

sufficiency. Promoting sustainable economic activities is a key component of improving environmental sustainability.

Belau Watershed Alliance (BWA)
BWA is an organization comprised of representatives from government organizations, NGOs, and the private sector with the mission of improving watershed management throughout Palau. The BWA promotes cooperation between various stakeholders in order to make the best possible use of available knowledge and resources to protect water quality and quantity, ecosystem services and biodiversity within watersheds. In September 2013 the BWA hosted a regional watershed management summit in Koror which included attendees from throughout Micronesia.

1.4.3 Non-Government Organizations

NGOs have come to play an important role in conservation and protection of the environment in Palau. NGOs have supported a broad range of activities affecting environmental management and conservation of biodiversity, including building organizational and human resources capacity, working to promote environment-friendly legislation, reaching out to the public, and working with stakeholders to develop management policies that address environmental issues while also reflecting community interests.

The Nature Conservancy (TNC)
TNC has been working in Palau since 1990, initially in partnership with the national government, primarily with the Division of Marine Resources. TNC assisted in establishing the Palau Conservation Society and has continued to provide ongoing collaboration, support and services to local partner organizations. (ADB, 2007)

Palau Conservation Society (PCS)
Since 1994, PCS has worked with Palauan communities to protect natural resources by establishing locally managed conservation areas, developing watershed management strategies and increasing awareness about all aspects of conservation and protection of natural resources. PCS has worked with several states to create, monitor and manage many marine protected areas. In 2002, PCS began to focus more effort on working with communities and partner agencies on conservation and awareness projects on Babeldaob, where much of the new development in Palau is occurring. (ADB, 2007) Working with Airai state government and EQPB, in 2013 PCS completed the 5-Year Airai State Watershed Management Plan, the first state-level watershed management plan in Palau.

1.5 PALAU'S TERRESTRIAL AND COASTAL BIODIVERSITY (2004-2014)

"Conservation is a cause that has no end. There is no point at which we say 'Our work is finished'." *Rachel Carson*

Palau contains some of the most diverse and pristine ecosystems in the world. These diverse habitats are home to an extraordinarily high number of marine and terrestrial species that are essential to the culture, economy and livelihoods of the Palauan people. Many species and ecosystems are endemic or rare and conserving Palau's resources is important globally.

Palau is home to the greatest area of continuous native forest in Micronesia. There are over 303.51 km^2 of forest cover throughout the islands. With more than 1200 species of plants, of which over 860 are native, Palau's forests are the most species-diverse in Micronesia. In addition to their direct biodiversity values the forests provide vital ecological services that help to maintain the health and ecological integrity of all of the terrestrial and marine ecosystems (e.g. sediment trapping, climate stability, nurseries for reef fish, soil production and conservation, etc.). Nine types of forest are found throughout Palau including; Upland Native Forest, Low Coastal Island Forest, Raised Limestone Island Forest, and Mangrove Forest. Agro-forest covers 10.92 km^2 and is dominated by coconut stands. Palau's forests are highly valued as watershed areas, for preventing soil erosion, as sources of firewood, medicines, building materials, and as areas to forage and hunt for food.

1.5.1 The Diversity of Palau's Vascular Plants

Palau has 724 known species of native vascular plants including at least 194 endemic species. The total number of terrestrial plant species in Palau is estimated to be approximately 1,200 with an estimated 25% rate of endemism. At least ten of the known endemic species are categorized as endangered, threatened or vulnerable.

Endemic Plant Species of Concern		
Botanical Group	**Scientific Name**	**Status**
Annonaceae	*Goniothalamus carolinensis*	Near-Threatened
Arecaceae	*Ponapea palauensis*	Critically Endangered
Arecaceae	*Hydriastele palauensis*	Near-Threatened
Orchidaceae	*Nervilia trichophylla*	Near-Threatened
Orchidaceae	*Peristylus palawensis*	Near-Threatened
Pandanaceae	*Pandanus kanehirae*	Near-Threatened
Pandanaceae	*Pandanus peliliuensis*	Vulnerable
Apocynaceae	*Rauvolfia insularis*	Vulnerable
Fabaceae	*Parkia parvifoliola*	Endangered
Rubiaceae	*Maesa canfieldiae*	Vulnerable

Endangered Tree Species

Ponapea palauensis (Chesebuuch) (Critically Endangered): The most important stands of this endemic palm tree are found in the Rock Island Southern Lagoon World Heritage Site. Observations that an introduced bird species, the Sulphur-crested Cockatoo (*Cacatua galerita),* feeds in the crowns of this species have led to the suspicion that the bird poses a threat to the palm's survival. Koror State Government, which manages the world heritage site, is actively monitoring birds and trees to assess the situation.

Parkia parvifoliola (Kmekumer) (Endangered): Once widespread and prized for the quality of its lumber, this endemic species has become exceedingly rare despite the lack of harvesting for many years. The largest known stand is located in the upper reaches of the Ngermeskang River in Ngaremlengui State. The locality was recently nominated for membership in the Protected Areas Network in order to conserve this rare species and other wildlife in the watershed. The reasons for the decline of this endemic tree are unclear and additional research is needed to determine its habitat requirements, pollinators, seed dispersers and other factors that may have a bearing on its survival. Research is also needed to develop a means of cultivating the species from seed. One immediate threat is wildfires, which could destroy the few remaining trees or seriously degrade their surrounding habitat.

1.5.2 The Diversity of Palau's Terrestrial Macroinvertebrates

Arthropods (Insects and related organisms)

Insects and related arthropods are vital to maintaining the biodiversity of every terrestrial ecosystem in Palau through the roles that they play in the web of life as pollinators, recyclers, dispersers of plant propagules and food sources for birds and other wildlife. It is often wisely said that without insects most of the world's (and Palau's) terrestrial biodiversity would become rare or extinct. A survey of Micronesia conducted by the Bishop Museum during the administration of the U.S. Trust Territory of the Pacific Islands documented over 1,200 species of insects and closely related arthropods from Palau with an endemism rate of approximately 25%. More recent survey work indicates that the total number of terrestrial arthropods in Palau may approach 10,000 species.

Major Groups of Terrestrial Arthropods of Palau	
Taxon (Class or Order)	**Common Name**
Tardigrada	Tardigrades
Scorpiones	Scorpions
Schizomida	Short-tailed Whipscorpions
Amblypygi	Tailless Whipscorpions
Araneae	Spiders
Opiliones	Harvestmen
Acari	Mites and Ticks
Pseudoscorpiones	False Scorpions
Diplopoda	Millipedes
Chilopoda	Centipedes
Pauropoda	Pauropods
Symphyla	Symphylans
Branchiopoda	Freshwater Shrimp
Amphipoda	Amphipods
Isopoda	Sowbugs and Woodlice
Collembola	Springtails
Diplura	Diplurans
Microcoryphia	Jumping Bristletails
Thysanura	Silverfish
Ephemeroptera	Mayflies
Odonata	Dragonflies and Damselflies
Orthoptera	Grasshoppers, Crickets and Katydids
Phasmatodea	Walkingsticks
Dermaptera	Earwigs
Isoptera	Termites
Mantodea	Mantises
Blattodea	Roaches
Hemiptera	True bugs and related insects
Thysanoptera	Thrips
Psocoptera	Booklice
Phthiraptera	Lice
Coleoptera	Beetles
Neuroptera	Lacewings and Antlions
Hymenoptera	Bees, Wasps and Ants
Trichoptera	Caddisflies
Lepidoptera	Moths and Butterflies
Siphonaptera	Fleas
Diptera	Flies, Midges and Mosquitos

The NBSAP calls for an ongoing national taxonomic needs assessment in order to complete the process of cataloging this rich diversity. In response, Belau National Museum added a Natural History Section to its organizational structure for the purpose of filling the gaps in our knowledge of Palau's biodiversity. The newly–formed section supports field research by staff members and visiting scientists as well as maintaining a scientific repository collection of preserved insect specimens and educational displays in the museum's Natural History Gallery.

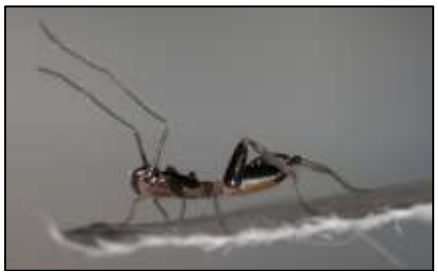
The known terrestrial arthropod fauna of Palau includes species from 38 major taxonomic groups. The richest diversity is found in the Class Hexapoda (insects), which is the most diverse group of animals on the face of the earth. Palau's Insect species represent 26 of the 31 recognized taxonomic Orders of Hexapoda in over 100 Families.

Palau's arthropod diversity includes many unusual and noteworthy species. Among the flies, for example, the endemic Palau Horsefly, *Tabanus palauen*sis (Diptera: Tabanidae),

is the only native horsefly in Micronesia and the endemic Palau March Fly *Plecia palauensis* (Diptera: Bibionidae), is the only known march fly in Oceania. An endemic damselfly, *Drepanosticta palauensis*, is listed as endangered due to restricted habitat and rarity. Palau has at least two other endemic damselflies that are more abundant.

Endemic Damselfly, *Pseudagrion palauense*

Another noteworthy component of Palau's arthropod fauna is the presence of the rare Order Schizomida or Short-tailed Whipscorpions. Only 200 species of this rare group are known worldwide and at least one (as yet unnamed) of those species occurs in Palau. They are also known as "grasshopper spiders" due to their elongated hind legs used for jumping.



Palau Short-tailed Whipscorpion (Schizomida)

One noteworthy aspect of Palau's biodiversity is the presence of insects that have adapted to marine habitats, an environment that is normally hostile to insects. Several near-shore and pelagic species of Sea Skaters (*Halobates* spp.) are found in Palau's waters and the midge, *Pontomyia oceana* (Chironomidae), is found only on the coral barrier reefs of Palau and Queensland. The recent discovery of an ant (Formicidae) species that lives exclusively in the littoral intertidal zone added one more unusual species to the list of Palau's marine insects. The marine littoral ant, *Odontomachus malignus*, was first discovered in Palau in 2007. Palau is the only place in Micronesia where this rare species is found.

Ants provide an example of the urgent need for further study of the diversity of terrestrial arthropods. Recent survey work has increased the number of ant species known to occur in Palau from an original estimate of 16 species to 80 or more species with at least eight previously undescribed species and two undescribed Genera. The surveys established the presence of functional groups of ants that can be used as bioindicators for monitoring the health of Palau's forest ecosystems.

1.5.3 The Diversity of Palau's Gastropods

Land and Freshwater Snails

Land snails are among the most extraordinarily diverse animals in Palau and at least 95% of these species are endemic to Palau (Rundell, 2010). Palau's land snail biota is severely understudied, but initial research on these species over the past decade shows that there are likely ca. 200 species, most of which are new to science, and many of which are threatened with extinction (Rundell 2008, 2010; 57 IUCN conservation assessments: Rundell 2012; O'Foighil and Rundell 2012a-c). Discovering species, mapping species' geographical distributions, and

describing species from collections are critical components of ongoing research in Palau, since only species with locality data and formal taxonomic names can be assessed under IUCN criteria and subsequently prioritized for conservation efforts.

Endemic land snail species are found throughout the Palau archipelago, from Kayangel (Ngcheangel) atoll in the North to Angaur (Ngeaur) in the South. The Southwest Islands also harbor indigenous, and possibly endemic species (Rundell 2003, unpublished data) and comprise a fauna distinct from that of the main archipelago. Within the main Palau archipelago, indigenous forests have the highest land snail diversity and endemism. Of these forests, indigenous forests of the Rock Islands have the highest land snail diversity and endemism, although the island of Babeldaob also harbors several land snail species that are endemic only to Babeldaob's volcanic forest.

Within Babeldaob there are also important "hotspots" of land snail diversity, particularly the limestone outcrop forests of Oikull and the surrounding areas. Among the many land snail species found there are Palau-endemic partulid tree snails, which have been driven to extinction or near-extinction on practically every other island in the Pacific. There are at least two species of large-bodied and charismatic partulid tree snail species in Palau (a third is presumed extinct). Live partulids are currently known only from isolated pockets in southern Airai State, Ulong, Ngeruktabel, and Ngermalk. Immediate threats to partulids include limestone quarrying, rats, and potential spread or reintroduction of invasive species. Predatory land snail species (e.g. the rosy wolf snail *Euglandina rosea*) and predatory flatworms have been unfortunately introduced throughout the Pacific in disastrous attempts at biocontrol. Because partulids are slow to reach reproductive maturity and give birth to live young one baby at a time, all of the above threats can have immediate and devastating impacts on these snails.

There are at least 4 introduced land snail and slug species in Palau (Cowie et al. 1996; Rundell 2013, unpublished data). Most of these are currently restricted to human-occupied or disturbed areas, but evidence from elsewhere in the Pacific suggests that introduced land snail and slug species (e.g. eggs and adults from imported soil, plants and other agricultural products) have the potential to spread into indigenous forests, and become permanently established. Many of these molluscan hitchhikers, particularly slugs, are major agricultural pests, meaning that thorough and regular inspections of shipments are imperative.

Palau's freshwater (including brackish water) snails are poorly known. Smith's (1991) review of the fauna lists 15 total freshwater mollusc species. The most recent comprehensive survey of freshwater snails by Cowie et al. (1996) uncovered 8 of these species (all of which are likely indigenous) from 5 collecting sites on Babeldaob. Incidental collections of 3 freshwater snail species were made on Babeldaob in 2013 (Rundell 2013, unpublished data).

1.5.4 The Diversity of Palau's Freshwater Fish

Very little is known about the native (indigenous) freshwater fishes of Palau. At least 50 species are thought to occur in Palau's rivers. The most diverse group is the gobies, which include four or more endemic species. There are five introduced species, including an invasive fish, *Tilapia* sp., which is currently confined to a settling pond at a rock quarry in Koror.

1.5.5 The Diversity of Palau's Herpetofauna (Reptiles and Amphibians)

Palau has 44 species of reptiles and two species of amphibians. Two of these are introduced species of freshwater turtles but no concrete evidence that either of these invasive species has established a breeding population in Palau. One of the lizard spcies is the introduces anole, *Anolis carolinensis*. Among the native Palauan reptiles are four species of sea turtles, seven snake species, 30 lizard species and one species of crocodile. One of the lizard species is known from skeletal remains only. The two Palauan amphibians are an introduced toad and an endemic frog. The 44 species of herpetofauna are distributed among fourteen taxonomic Families. Two amphibian families, five lizard families, five snake families, one marine turtle family and one crocodile family are represented in Palau.

The Palauan frog, *Platymantis pelewensis*, is the only endemic amphibian in Palau. It is unusual in that very few endemic frogs are known from small island countries. Its closest relatives are found in New Guinea and the Philippines. Large numbers of females of the Palauan frog have been observed to congregate in caves and abandoned World War II bunkers. The purpose of this behavior is unknown. The other amphibian is the introduced marine toad, *Bufo marinus*.

The Palauan blind snake is an endemic burrowing species while the remaining native snakes are not endemic to Palau but enjoy a wider distribution in the Australasian and Oceanian regions. The most diverse group of Palauan reptiles is the lizards with 30 species including six endemic species. Two more of the thirty lizard species are categorized as "Pacific insular endemics" that are found only in the islands of the Pacific Ocean. Palau is unusual among Pacific islands in having a native boa constrictor. This snake species is also found in Papua/New Guinea. Two endemic lizards are seemingly rare. The Palauan pandanus skink is known only from leaf axils of pandanus trees. One endemic gecko species is known from only two islets in the Ngerukewid Nature Reserve. One Pacific insular endemic lizard is found only in the Southwest islands in Palau; however, it also occurs in other islands across the Pacific. The coastal waters and the open sea surrounding Palau support eight species of marine reptiles. Four species of sea turtles are known from Palauan waters. The saltwater crocodile, *Crocodylus porosus*, also occurs in Palau's waters. Sea turtles and the crocodile are protected species. In addition, there are three species of sea snakes known from Palau. The dog-faced sea snake is normally seen in or near mangrove forests. The banded sea krait is common throughout the lagoon. A third pelagic sea snake is reported from waters outside Palau's fringe reef. All three are venomous.

1.5.6 The Diversity of Palau's Birds

A total of 171 bird species have been reported from Palau: 52 resident species, 7 pelagic species, 66 migratory species, 44 vagrant species and 2 introduced species that have been extirpated or

eradicated. Palau's bird diversity is highlighted by 21 endemics including 11 endemic species, 6 endemic subspecies and 2 endemic genera.

Endangered Bird Species

Palau Megapode, *Megapodius laperouse senex* (Endangered). There are two subspecies of the endangered Micronesian Megapode, one in the Commonwealth of the Northern Mariana Islands (*M.l. laperouse*) and one in the Republic of Palau (*M.l.senex*). They are categorized as endangered based on restricted range and small, isolated populations. Differences between the subspecies with respect to morphology, vocalizations, ecology and ectoparasites indicate that they may actually be separate species. The largest subpopulation in Palau is found in the Rock Islands Southern Lagoon UNESCO World Heritage Site.

Endemic Birds		
Common Name	**Scientific Name**	**Palauan Name**
Micronesian Megapode	*Megapodius laperouse senex*	Bekai
Rufous Night-Heron	*Nycticorax caledonicus pelewensis*	Melabaob
Purple Swamphen	*Porphyrio porphyrio pelewensis*	Uek
Nicobar Pigeon	*Caloenas nicobarica pelewensis*	Laib
Palau Ground-Dove	*Gallicolumba canifrons*	Omekrengukl
Palau Fruit-Dove	*Ptilinopus pelewensis*	Biib
Micronesian Imperial-Pigeon	*Ducula oceanica*	Ieb
Palau Owl	*Pyrroglaux podargina*	Chesuch
Palau Swiftlet	*Aerodramus pelewensis*	Chesisekiaid
Rusty-capped Kingfisher	*Todiramphus cinnamominus pelewensis*	Cherosech
Micronesian Honeyeater	*Myzomela rubratra kobayashii*	Chesisebangiao
White-breasted Woodswallow	*Artamus leucorynchus pelewensis*	Mengaluleu
Morningbird	*Colluricincla tenebrosa*	Tutau
Palau Fantail	*Rhipidura lepida*	Melimdelebteb
Palau Flycatcher	*Myiagra erythrops*	Charmelachull
Palau Bush-Warbler	*Cettia annae*	Wuul
Citrine White-eye	*Zosterops semperi semperi*	Charmbedel
Dusky White-eye	*Zosterops finschii*	Chetitalial
Giant White-eye	*Megazosterops palauensis*	Charmbedel
Micronesian Starling	*Aplonis opaca*	Kiuid
Blue-faced Parrotfinch	*Erythrura trichoa pelewensis*	- - - -

The Palau Megapode builds an unusual nesting mound to incubate its eggs. The mound (pictured left) is composed of a core of leaf litter and plant detritus that is covered with sand, soil or coral rubble to form a mound that uses the heat from the composting core to incubate the eggs that are subsequently buried in the mound. Over 90% of these nesting mounds are located in low-lying coastal strand forests that are threatened by rising sea levels and increasingly destructive typhoons due to climate change.

Black-tailed Godwit, *Limosa limosa* (Endangered):
Small numbers of this endangered migratory species visit Palau as transients during the annual migration from central Asia to Western Australia. In Palau, it is attracted to sand flats in the lagoon and to artificial wetland habitats such as aquaculture facilities and sewage treatment ponds. It feeds on invertebrates by probing the mud or sand with its long beak. The species is categorized as endangered due to loss of nesting ground habitat in central Asia. A non-threatened sibling species, the Bar-tailed Godwit, *Limosa lapponica*, also transits through Palau during the migratory season.

Near-Threatened Bird Species

Nicobar Pigeon, *Caloenas nicobarica pelewensis* (Near-Threatened): Palau's population of the endemic subspecies of this near-threatened species is apparently stable. Nicobar Pigeons are a keystone forest species by virtue of their habitat of burying fruit of forest trees in the soil, which enhances germination and strengthens the overall biodiversity of forest ecosystems in Palau. The Nicobar Pigeon is the flagship species of Palau's National Program for Monitoring Forest and Coastal Birds.

Palau Ground-Dove, *Gallicolumba canifrons* (Near-Threatened):
This endemic species shares range and habitat with the Palau Megapode and is subject to the same climate change threats. Perhaps because of its secretive nature, the Palau Ground-Dove is thought to be Palau's rarest endemic bird. It is most often encountered in remote localities such as the Rock Islands Southern Lagoon UNESCO World Heritage Site

Micronesian Imperial-Pigeon, *Ducula oceanica* (Near-Threatened):
This species is threatened by poaching and loss of habitat throughout its range in Micronesia. The Palau subpopulation is in decline due to illegal hunting and habitat degradation. As a

canopy frugivore, it is a keystone species that disperses fruit, seeds and other propagules of forest trees. In other Pacific localities where Imperial-Pigeons and other canopy frugivores were extirpated, the forest tree diversity gradually decreased.

Giant White-eye, *Megazosterops palauensis* (Near-Threatened): This endemic Genus and species is categorized as Near-Threatened due to an extremely restricted range in Palau's Rock Islands and Peleliu Island. Within its range, however, the Giant White-eye can be found in sizeable flocks of 10 to 20 birds. It feeds on insects, seeds and fruit. It is often seen in mixed flocks with the other Palauan species of white-eyes.

Threats to Palau's Bird Diversity

Climate Change: Rising sea levels due to climate change as well as the increased frequency and intensity of tropical typhoons also due to climate change are the most urgent threats to Palau's bird diversity. The Palau Megapode is critically endangered by climate change because over 90% of its nesting ground habitat is in low-lying coastal strand forests that are threatened with inundation from rising sea levels and increasingly intense typhoon tidal surges. A recent "king" tide (2013) and the tidal surges from supertyphoons Bopha (2012) and Haiyan (2013) have destroyed approximately 15% of the megapode nesting grounds in Palau. Many other forest-dependent birds are threatened with habitat loss from salt infiltration of low-lying forests due rising sea levels and from increasingly destructive typhoon winds. This is especially true for seabird nesting grounds that are often located on low atolls and sand bars.

Other threats to bird diversity include illegal hunting and egg-harvesting; habitat destruction from construction projects; overharvesting of forest trees and invasive species.

Response: Conserving Palau's Bird Diversity

Important Bird Areas (IBAs): Two Important Bird Areas in Palau, Fanna Island and Helen Reef, have been established to protect globally significant nesting populations of seabirds (Black Noddies and White Terns). The largest population of Red-footed Boobies in Micronesia also nests in these areas as well as several other seabird species.

National Program for Monitoring Forest and Coastal Birds: Established in 2010, the National Program for Monitoring Forest and Coastal Birds (NPMFCB) was established to address the nation's obligations to under the Convention on Biological Diversity including the National Biodiversity Strategic and Action Plan (NBSAP). The work of the National Program for Monitoring Forest and Coastal Birds is divided into three main categories:

- Regular monitoring of bird diversity at permanent monitoring stations
- Site-specific inventories of bird diversity
- Population estimates for selected species

The NPMFCB commands a national database of field observations of bird diversity that was initiated by Belau National Museum (BNM) and is maintained by museum scientists under the guidance of the national focal point for the Global Taxonomy Initiative (GTI) and in coordination with Palau Conservation Society, a BirdLife International partner. Through regular, continuous monitoring of bird diversity since the inception of the database in 2006, the national bird diversity database now holds approximately 20,000 entries and continues to grow. Regular reports are issued to inform conservation managers of local and national trends that are revealed in the database. The program issues an annual report, *State of Palau's Birds*, which describes major national trends, reports the progress of community bird conservation initiatives and enhances general awareness of the importance of Palau's bird diversity.

1.5.7 The Diversity of Palau's Terrestrial Mammals

As is the case with many small, isolated Pacific islands, Palau's native diversity of terrestrial mammals is limited to bats and rats. The most striking is the Palau Flying Fox (an Old World Fruit Bat), *Pteropus mariannus pelewensis*., which was hunted commercially for export to Guam until exportation was banned by the Palau government. Still, it is not protected from being hunted for local consumption (including the restaurant trade) and its numbers appear to be declining. In the not too distant past, Palau was home to a second, and endemic, species of flying fox, *P. pilosus*, thought to be extinct from unknown causes and the only evidence of its existence is found in the one-hundred-old museum specimen that was used to describe the species. The insectivorous Pacific Sheath-tailed Bat is the only other bat species found in Palau.

The Pacific Rat, *Rattus exulans*, probably came to Palau millennia ago with the original Palauan settlers and it has become naturalized over the centuries. Three additional species of *Rattus* are of recent (20th century) introduction as is the House Mouse, *Mus musculus*. These recently introduced rodents appear to be commensal, or synanthropic, in distribution as does the recently introduced Asian Musk Shrew, *Suncus murinus*.

Threats to Biodiversity from Feral Mammals

Feral domesticated mammals (livestock and pets) represent a serious threat to Palau's native flora and fauna. These feral mammals include pigs, cats and monkeys. Feral pigs are responsible for habitat destruction and feral cats are opportunistic predators of native birds and reptiles. Feral monkeys on Angaur Island disrupt natural habitats, prey on native wildlife and destroy human crops. There are ongoing efforts in Palau to control all three.

Native and Introduced Mammals		
Common Name	**Scientific Name**	**Status**
Asian Musk Shrew	*Suncus murinus*	Introduced
Micronesian Flying Fox	*Pteropus mariannus pelewensis*	Native
Large Palau Flying Fox	*Pteropus pilosus*	Native (extinct)
Pacific Sheath-tailed Bat	*Emballonura semicaudata*	Native
Feral Long-tailed Macaque	*Macaca fasciularis*	Introduced
Feral Cat	*Felis catus*	Introduced
Feral Pig	*Sus scrofula*	Introduced
Pacific Rat	*Rattus exulans*	Naturalized

1.6 MARINE BIODIVERSITY

Considered one of the "Seven Underwater Wonders of the World," Palau has the highest levels of marine and terrestrial biodiversity within Micronesia, and is on the north-eastern margin of the area called "the Coral Triangle" which has the highest diversity of shallow-water marine species in the world (Green and Mous 2006). Although Palau has slightly fewer species than found in the coral triangle, the diversity of marine habitats found within the relatively small area of the Palauan archipelago is probably as great as would be found anywhere in the world. Palau supports more than 350 species of hard coral, 200 species of soft coral, over 300 species of sponges and more than 1,300 species of reef fish (Anon 2002). Its waters are also home to endangered and vulnerable species such as the dugong, saltwater crocodile, hawksbill and green turtles, and giant clams. Palau also has more than 50 marine lakes, of which five are home to stingless jellyfish that have evolved in these unique ecosystems.

Marine Fish	Marine Reptiles	Marine Mammals
With over 1387 fish species known to date, Palau has the richest fish fauna in Micronesia (95% of Micronesian fish species are found in Palau)	Sea Turtles Four species of sea turtles are found in Palau: Green, Hawksbill, Olive Ridley, and Leatherback.	Dugong There is one species of sirenian present in Palau, the dugong. Dugongs can be found throughout Palau's waters, except the Southwest Islands, and are thought to spend the daytime in deeper waters around the barrier reef to avoid boat traffic.
11 species of marine fish are known endemics to the Palau/Yap region.	Sea Snakes • There are about 50 species of sea snake in the world; Palau has two. •Laticauda columbrina, the "Banded Sea Snake," is a highly venomous species, active during the day, which comes onto land to lay eggs. •The Pelagic Sea Snake, Pelamis platurus, is the most widely distributed sea snake in the world. This snake rarely enters the lagoon in Palau.	Cetaceans •There are 11 species of cetaceans including a breeding population of sperm whales. This list includes spinner dolphins, fraser dolphins, pygmy killer whales and pilot whales.
	Crocodiles •There is 1 species of saltwater crocodile (Crocodylus porosus) present in Palau, although this remains to be confirmed.1 •Palau is home to the only population of crocodiles in Micronesia.	

Protoanguilla palau is a new species of small, eel-like fish discovered in a fringing-reef cave in the Rock Islands Southern Lagoon, Palau. The fish differs from all previously known eels in a number of important respects including a disproportionately large head, a short and compressed body, unusual collar-like gill openings and caudal fin rays that are only slightly produced. It is so distinct that it has been assigned to a new genus and new family, Protoanguillidae.
The new species was described by an international team led by Dr G David Johnson of the Smithsonian Institution's National Museum of Natural History and including collaborators from Kitasato University, Iwate, Japan, the Southern Marine Laboratory in Koror, Palau, and the Natural History Museum and Institute in Chiba, Japan.

Given this planktonic early life, the authors reason that the geographic distribution of this remarkable eel will ultimately prove to be much wider than Palau. There can be no doubt that its lineage had a different distribution for much of its existence since the Palau-Kyushu Ridge did not form until 60-70m years ago.

Coral Reefs	Corals	Echinoderms: Sea Stars, Urchins, and Sea Cucumbers
• The total coral reef habitat in Palau is 524.5 square km, composed of: - 194.8 square km of fringing reef - 264.7 square km of barrier reef - 65.0 square km of atoll reef - 418 reef holes	Scleractinian "hard corals" 385 species; 66 genera 425 species ; 78 genera	•Asteroidea (Sea stars) - At least 25 species of asteroids (sea stars) have been identified in Palau •Holothuridae (Sea Cucumbers) - At least 22 species of sea cucumbers inhabit Palau's waters, with 8 having been identified from Helen Reef. ,
1,136.5 square km of lagoon and passes are contained within the current reef configuration. The lagoon shelters the patch reefs, many pinnacle reefs and over 500 Rock Islands, provides feeding habitat for sea turtles, dugongs and seabirds, and supports important finfish and shellfish resources.	Octocorals "soft corals" 115 species; 59 genera	•Crinoidea (Crinoids or sea lillies) - There have been 22 crinoid species identified in Palau, of which one inhabits deep waters.
Barrier reef surrounds most of the main Palau islands except Angaur, Peliliu and Kayangel and Ngeruangel atolls.	Hydrocorals"fire corals" 7 species; 4 genera	• Opiouroidea (Brittlestars) – Two species of brittlestars have been recorded from Palau, but many more unrecorded species
Lagoon fringing reefs protect island shorelines, provide sand to replenish beaches, and support coral communities, sea grass beds and important finfish and invertebrate populations.		Echinoidea (Sea urchins) – 12 species have been recorded, but much work remains to be done on this group in Palau.

Some coral reefs in Palau are surviving and even thriving in highly acidified environments. Coral reefs in the Rock Islands around Nikko Bay appeared to be healthier than those in nearby reefs with less acidified waters.

That is according to research done by the Palau International Coral Reef Center and Woods Hole Oceanographic Institution in Massachusetts. The finding seemed to contradict the common expectation that acidified seawater, resulting from climate change, impairs coral growth.

The more acidified seawater is caused by three natural processes: the growth of reefs that removes carbonate ions, the breathing of organisms on the reef and the maze-like reef formation that retains water longer, so processes in the reef can change the chemistry of the water more dramatically.

Researchers at PICRC and Woods Hole are still conducting research on these resilient coral reefs

PART II: THE NBSAP, ITS IMPLEMENTATION, AND THE MAINSTREAMING OF BIODIVERSITY.

2.1 PROTECTING BIODIVERSITY THROUGH PROTECTED AREA SITE MANAGEMENT REGIMES

Biodiversity protection in Palau has been undertaken mainly through the establishment of protected areas. Biodiversity targets are identified and an action plan with associated funding is developed to guide biodiversity conservation and resource management actions. The following matrix describes Palau's protected area portfolio.

Palau's Protected Area Profile

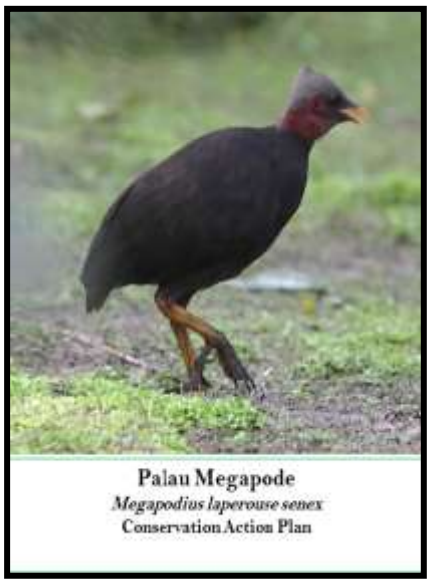
		Number	Total Area
Realm	Terrestrial	16	48.94 sq. km
	Marine (including coastal)	16	2372.43 sq. km
National Protected Areas: IUCN Management Category	Ia: Strict Nature Reserve	4	4.85 sq. Km.
	Ib: Wilderness Area	4	10.92 sq. Km.
	II: Ecosystem Protection/Recreation	6	31.63 sq. Km.
	III: National Monument or Feature	5	19.85 sq. Km.
	IV: Habitat/species management area	4	201.08 sq. Km.
	V: Protected Area with sustainable use	2	303.26 sq. Km.
	VI: Protected Landscape/Seascape	6	1891.22 sq. Km.
	Not Reported (NR)	19	971.15 sq. Km.
International Protected Areas	World Heritage	1	859 sq. km.
	Ramsar	1	6.44 sq. km.
	UNESCO MAB	1	98 sq. km.
	Others		

2.1.2 Palau Protected Areas Network (PAN)

The Palau Protected Areas Network is a nationwide network of terrestrial and marine protected areas that aims to protect areas of significant biodiversity, important habitats, and other valuable resources that are essential to the future social, cultural, economic and environmental stability and health of Palau. To date there are 13 PAN sites that consist of single sites and networked sites. These 13 sites have a management plan that guides conservation and natural resource management efforts within their borders and are implemented by site conservation officers employed at the state in which these sites are located. All of these managed sites have goals and objectives that speak to biodiversity conservation.

2.1.3 Species Conservation Action Plans

A small number of terrestrial and marine species are on the IUCN Red List. Efforts to improve the conservation status of these species are normally carried out as part of protected area management plan implementation. However, a number of these species are charismatic species and have generated sufficient public interest which has led to the development of a stand alone conservation action plan for the species in question. One such species is the Palau Megapode.



The Palau Megapode is an IUCN endangered bird whose conservation status is being imperiled by coastal erosion through storm surges and climate change. In 2013 efforts to draft a conservation action plan to address the threats to its status began. To date the plan has been completed and is now being integrated into protected area management plans of Kayangel and Koror States.

Genesis of the Palau Megapode Conservation Action Plan

In November 2011, the Koror State Rangers and Belau National Museum began an informal survey of the bird diversity of the Rock Islands Southern Lagoon UNESCO World Heritage Site. The preliminary results of the survey documented extensive activity of the endangered Palau Megapode throughout the World Heritage Site. The outcome was a recommendation to conduct a full survey of the megapode population in the World Heritage Site in order to develop effective management strategies to conserve this important species and potentially valuable ecotourism attraction. In 2012, Palau Conservation Society coordinated a full survey of the megapodes of the World Heritage Site in partnership with the museum and rangers, with funding from the BirdLife International Community Conservation Fund through the Royal Forest and Bird Protection Society of New Zealand. Based on the results and recommendations of the two surveys, the Koror State Government included megapode conservation action items in their five-year management plan for the World Heritage Site (KSG 2012).

2.2 UPDATING OF NBSAP

Although the 2005 Palau National Biodiversity Strategy and Action Plan (NBSAP) was not ratified by the Palau Olbiil Era Kelulau (OEK) or national legislature, the program of work outlined in the document has been implemented to various degrees by both government and non government organizations. The following narrative describes the efforts undertaken in support of this strategy.

According to the 2005 NBSAP the National Government leads implementation of UNCBD-related and NBSAP activities, in full partnership with the State governments, national and state Public Land Authorities, traditional leaders, and local communities. The lead national

government implementing and monitoring agency is designated as MNRET. The 2005 NBSAP called for an active role for the National Environmental Protection Council (NEPC; a committee formed in 2002 by Executive Order 205; consisting of representatives of all relevant environmental agencies and organizations, with OERC as Secretariat) to serve an advisory role to the Ministry. The NEPC was not active from 2008 to 2013 when it was reactivated into service by President Remengesau.

A 2007 report from the ADB stated that for MNRET to effectively implement the NBSAP, it needed to carry out the following recommendations illustrated in the table below.

Recommendation	Activity	Comment
Establish an implementation coordinator position within the Ministry of Natural Resources Environment and Tourism	MNRET is currently developing a terms of reference for this position	
Establish local experts panels to support implementation efforts	• The National Environment Protection Council has been activated- that body is mandated to coordinate environment and biodiversity efforts • The Belau Watershed Alliance (BWA) was instrumental in pushing for the development of protected area management plans	the Palau Conservation Consortium is an informal group of practitioners who meet regularly to discuss and partner in conservation/resource management activities
Identify all regional and international agencies and organizations that can provide funding and technical assistance	The National Government recently created a grants office and one of its mandate is to keep a roster of funding opportunities	Palau Small Grants Program, the Palau PAN Fund are two national programs that have funding schemes for biodiversity conservation
Establish a formal clearinghouse mechanism to ensure continual assessment of government agencies, statutory bodies, non-governmental organizations, local communities and the private sector	Unknown	
Establish an achievable and measurable monitoring plan stressing coordination between the National Government and state governments	Protected areas that are also PAN sites are mandated to conduct biodiversity monitoring. Additionally the PAN Office conducts management effectiveness assessments of sites.	
Develop reporting mechanism to effectively distribute updates and progress reports on all biodiversity related programs and activities	Palau has developed a reporting manual and template to aid in reporting of the RIO conventions. This manual and template fulfills this requirement	

2.3 CBD IMPLEMENTATION SINCE LAST NATIONAL REPORT

Palau's NBSAP Theme 2 - Species Protection - calls for two ongoing actions in order to meet objective 1 "To develop a comprehensive inventory of species to identify and prioritize their importance and status." The two actions are to (1) conduct a national taxonomic needs assessment and (2) conduct national surveys to inventory biodiversity. Although neither action received the recommended official financing for the terrestrial and coastal components of Palau's biodiversity, several NGOs stepped forward to begin filling the gaps in Palau's terrestrial and coastal biodiversity inventory. The leaders in the efforts to address this objective are Belau National Museum and Palau Conservation Society, working in collaboration with various donors and international organizations such as BirdLife International and IUCN as well as the national focal point for the Global Taxonomy Initiative and several government agencies in Palau and the United States.

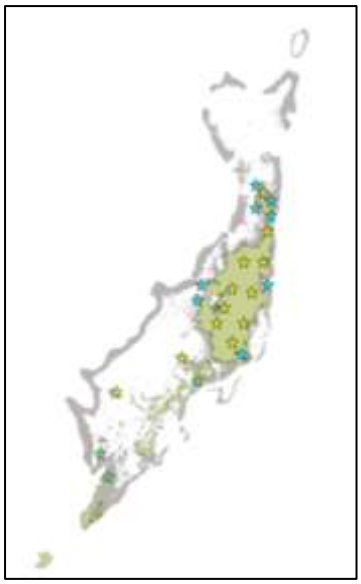
Taking stock of our progress since the inception of the NBSAP in 2004, several highlights stand out as examples of progress in pursuit of the NBSAP objective with regard to terrestrial and coastal biodiversity:

- Establishment of the National Program for Monitoring Forest and Coastal Birds
- Completion of national inventories
  - Resident and migratory birds
  - Land snails
  - Ants
  - Aquatic macroinvertebrates
- Population estimates for two priority bird species
  - Palau Megapode
  - Rufous Night-Heron
- Development of a Conservation Action Plan (CAP) for the endangered Palau Megapode
- Establishment of priority conservation areas based on biodiversity inventories
  - Ngermeskang Bird Sanctuary
  - Kmekumer Reserve for nesting grounds: Hawksbill Turtles, Palau megapodes
- Inventories of the UNESCO Rock Islands Southern Lagoon World Heritage Site
- Identification of specific taxonomic needs
  - Speciation of the subspecies of the Micronesian Megapode
  - Taxonomic Descriptions of undescribed ant species

2.4 BIODIVERSITY AND MONITORING

2.4.1 Regular Monitoring of Bird Diversity

Monitoring of Resident Birds



In Palau, bird diversity and bird indicator species are now used to monitor the health of forest and coastal ecosystems. The map of Palau (right) depicts the locations of the 23 permanent monitoring stations currently operated by the NPMFCB using the official Protected Areas Network (PAN) bird-monitoring protocols for the environmental monitoring of forest and coastal ecosystems.

Twelve of the stations (yellow stars) are terrestrial stations that are positioned in the major terrestrial ecosystem types found in Palau. Seven of the terrestrial stations are located in protected areas including Ngermeskang Bird Sanctuary, Lake Ngardok (a Ramsar wetland) and the Rock Islands Southern Lagoon UNESCO World Heritage Site. Another station is located in the Ngerikiil Watershed, an Integrated Water Resource Management (UNDP/IWRM) area and the principal source of Palau's municipal water supply. Eight of the stations (blue stars) are positioned at coastal viewpoints for monitoring the bird diversity of major coastal ecosystems. Three of the coastal stations are located in Marine Protected Areas and one at a state beach. Three of the stations (green stars) are positioned to simultaneously monitor bird diversity in both forest and coastal ecosystems.

Monitoring of Migratory Birds

Palau is the only locality in Micronesia that is well within the East Asian-Australasian flyway used by migratory birds on their seasonal flights between Asia and Australia (map). Consequently, Palau's list of migratory is longer than any other locality in Micronesia. The NPMFCB scientists monitor these birds during the migratory season (October through March). All the monitoring data is submitted to the global eBird database at Cornell University. Recent results from that monitoring revealed an increase in the numbers of Black-winged Stilts, which is consistent with the global data indicating that this species is expanding its range eastward into the Pacific.

Map courtesy Wetlands International

Every year since 2006, Palau has experienced new records of migratory bird species. Some of these new species have shown a tendency to return to Palau on an annual basis. From a global perspective, Palau is increasingly important as on outlying way station for migratory birds.

Asian House Rat	*Rattus tanezumi*	Introduced
Norway Rat	*Rattus norvegicus*	Introduced
Himalayan Rat	*Rattus nitidus*	Introduced
House Mouse	*Mus musculus*	Introduced

2.4.2 Regular Monitoring of Marine Biodiversity

Marine protected areas are an important tool in coral reef resource management. The ability to monitor the effectiveness of management measures is a critical component of natural resource management. Marine protected areas that are formally recognized within the PAN framework are required to develop a management plan with a monitoring and evaluation element. PICRC as part of the Micronesia Challenge Measures efforts has developed a monitoring protocol for Palau which has subsequently been endorsed by the Ministry of Natural Resources, Environment and Tourism. The protocol is intended to provide technical guidance to state governments in developing site-based monitoring plans to complement existing management plans.

General Indicator	Measurable Indicator	Survey Method*
Reef fish	• Species density (No. of fish/m^2) • Species biomass (Kg of fish/m^2)	Underwater visual census by snorkel or SCUBA • Belt transect (5m x 50m) along 50m transect. • Five x 50 m transects per station • 3 stations per MPA and Control site (each habitat type)
Benthic community	• % Coral cover (genus level) • % Benthic cover (Sand, Rubble, Carbonate, macroalgae, turf, etc.)	Photo quadrat method by snorkel or SCUBA • Photo quadrat (0.5m x 0.5m) every meter per transect • Five x 50 m transects per station • 3 stations per MPA and Control site (each habitat type)
	• Coral recruitment (genus level) (Number of colonies/m^2) • Size of individual recruits)	Underwater visual census by SCUBA • Belt transect (0.3m x 10m at the beginning of each 50m transect, See above)
Invertebrates(high value for commercial and subsistence)	• Species density (Number of individual/m^2) • Size of individual invertebrate	Underwater visual census by Snorkel or SCUBA • Belt transect (2 x 50m) of each 50m transect, See above)
Sea grass community	Species cover	Quadrat method by snorkel or SCUBA • Quadrat (0.5m x 0.5m) every 5 meter at the first 20m of each 50m transect (i.e., 5 quadrat/transect, See above)
Sediment	Organic and inorganic sediment weight (mgcm^2/d)	Sediment traps • 2 sediment traps (5.08cm diameter)/station • Traps retrieved every month.
Visibility	Horizontal or vertical visibility in meter at seabed	Use of Secchi disc
Temperature	Water temperature (^{0}C)	Data logger deployed at the site that records every 20 minutes

This protocol aims to standardize monitoring across MPAs by providing guidance on monitoring objectives, sampling design, indicators, and methodology. The objectives of coral reef monitoring are to assess how successful and efficient management strategies are in improving resource conditions and to provide managers with information to help them promote adaptive management of MPAs. Coral reef monitoring is also expected to answer questions relating to the condition of resources and the views and behavior of people using the resources.

Long-term Coral Reef Monitoring

PICRC continues to monitor 22 permanent sites across Palau. Analysis of data collected from this activity is ongoing. Interesting findings in 2012 included information that the condition of Palau's south-western outer reefs were in strikingly excellent condition; outer reefs had significant positive relationships between coral cover and densities of invertebrates and fish; and that outer reefs showed a surprising lack of relationship between reef rugosity and fish densities. In 2010 PICRC adjusted the long-term monitoring program to include 80 randomly chosen sites to assess coral bleaching. In 2011 and 2012 those data were analyzed. The results of the bleaching survey showed that coral bleaching

Minister Harry Fritz endorsing Palau's marine monitoring protocol

was significantly lower in the sheltered bays than on outer and patch reefs, indicating that bay reefs are more resilient to bleaching.

Conducting Research to inform management of natural resources
Fish status

In early 2012 PICRC analyzed existing data on fish and reported to traditional leaders that fish populations across Palau continue to decline. However, areas with effective management in place showed signs of minimizing the decline. In 2012 PICRC completed a pilot study to assess populations of Bumphead Parrotfish and Napoleon Wrasse. A national ban on their harvest was implemented in 2006. In the pilot study, researchers surveyed 27 sites for the fish. Findings from that survey show the population of the fish rebounding. Preliminary analysis shows the value of management measures such as closure of a fishery as a means to improve the status of said fishery.

2.5 ENVIRONMENTAL EDUCATION, PUBLIC AWARENESS AND PUBLIC PARTICIPATION

Effective communication and outreach are the cornerstones of effective biodiversity conservation. Conservation organizations such as PCS have continually prioritized effective communication of environmental information to raise awareness about Palau's environment and unique biodiversity. As 2014 is the International Year of Small Island Developing States and May of 2014 has been set aside to celebrate Island biodiversity, conservation organizations in Palau are preparing to develop and implement programs intended to celebrate island biodiversity.

PART III: PROGRESS TOWARDS THE 2015 AND 2020 AICHI BIODIVERSITY TARGETS AND CONTRIBUTIONS TO THE RELEVANT 2015 TARGETS OF THE MILLENNIUM DEVELOPMENT GOALS.

3.1 PALAU'S PROGRESS TOWARDS THE IMPLEMENTATION OF A STRATEGIC PLAN FOR BIODIVERSITY 2011-2020 AND ITS AICHI BIODIVERSITY TARGETS

Most of Palau's NBSAP efforts have gone towards achieving the Aichi Targets that are listed below. Although these targets have not been achieved in their entirety, significant progress has been made in all of them.

Target 1 By 2020, at the latest, people are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably.

A number of organizations both public and private have been actively promoting biodiversity awareness. Most of these awareness activities are general awareness such as those that occur during Palau's annual Earth Day celebrations, the Palau Conservation Society's annual general membership meeting and during Palau's education awareness week. However, more targeted biodiversity awareness activities have been implemented for community groups as well as traditional and elected leaders deliberating resource management issues.

Target 2

By 2020, at the latest, biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems.

In the last 10 years a number of protected area sites have begun to incorporate eco-tourism activities within their management regimes. These enterprises integrate biodiversity and cultural resources into a tourism offering that is marketed to Palau's visitors. In this way local communities are able to utilize their abundant biodiversity to generate incomes.

Target 5

By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.

Palau recently adopted a forest management plan. A major objective of that plan is to ensure zero loss of Palau's forest resources. This plan is being implemented by the Division of Forestry under the Bureau of Agriculture within the Ministry of Natural Resources, Environment and Tourism.

Target 9

By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.

Palau has recently drafted and adopted a national invasive species management plan. This plan's focus is mostly on terrestrial invasive species but there are recommendations for including a more robust marine component.

Target 10
By 2015, the multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized, so as to maintain their integrity and functioning.
Palau has adopted a sustainable land management policy that is being integrated into planning processes at both the state and the national level. This has resulted in a reduction of sediment along Palau's near shore areas.

Target 11*By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.*
The Palau Protected Areas Network (PAN) is a network of protected areas representing key habitats and species which ensures long-term sustainable use of resources, and has the institutional flexibility to adapt to future change. The PAN enables communities to manage their local environment, including biodiversity and to evaluate their needs and implement management regimes and monitoring programs that are locally appropriate.
The Palau PAN currently offers sustainable financing, capacity building opportunities for local site managers, and scientific and technical assistance to Palau's protected areas.

Target 12
By 2020 the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.
Palau has just completed a Megapode conservation action plan. The Palau Megapode is an IUCN listed endangered bird and this plan is being integrated into existing management plans in communities where there is a significant population of these birds.

Target 14
By 2020, ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable.
Palau recently adopted a water policy to guide management actions at both the local community and national level. Additionally, best water management actions are being promoted by the Belau Watershed Alliance an NGO whose mandate is to ensure sufficient water quality and quantity for all of Palau.

Target 16
By 2015, the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization is in force and operational, consistent with national legislation.
Palau is in the process of developing an ABS strategy for itself.

Target 17
By 2015 each Party has developed, adopted as a policy instrument, and has commenced implementing an effective, participatory and updated national biodiversity strategy and action plan.
Work on developing Palau's NBSAP are ongoing.

Target 18
By 2020, the traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of indigenous and local communities, at all relevant levels.
Palau's traditional conservation ethic underpins much of its NBSAP efforts. However, a more targeted process of ensuring that Palau's traditional ecological knowledge and expressions of culture around biodiversity is collected and utilized needs to be realized.

Target 19
By 2020, knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied.
Palau has made significant strides in developing methodologies that incorporate biodiversity values into natural resource assessments. Some of those have been described in the preceding chapter.

Concluding Remarks
Based on the information that has been provided it is evident that Palau has achieved many of the enabling factors necessary for achieving the Aichi Targets and for successful implementation of a National Biodiversity Strategy and Action Plan once it has been drafted.

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