

[Master's Theses](#)

[Master's Theses and Graduate Research](#)

2008

Customary marine tenure and traditional ecological knowledge in Palau

Robin Putney
San Jose State University

Follow this and additional works at: https://scholarworks.sjsu.edu/etd_theses

Recommended Citation

Putney, Robin, "Customary marine tenure and traditional ecological knowledge in Palau" (2008). *Master's Theses*. 3493.
DOI: <https://doi.org/10.31979/etd.32rm-qsex>
https://scholarworks.sjsu.edu/etd_theses/3493

CUSTOMARY MARINE TENURE AND TRADITIONAL ECOLOGICAL
KNOWLEDGE IN PALAU

A Thesis

Presented to

The Faculty of the Department of Environmental Studies
San José State University

In Partial Fulfillment

Of the Requirements for the Degree
Master of Science

by

Robin Putney

May 2008

UMI Number: 1458135

Copyright 2008 by
Putney, Robin

All rights reserved

INFORMATION TO USERS

The quality of this reproduction is dependent upon the quality of the copy submitted. Broken or indistinct print, colored or poor quality illustrations and photographs, print bleed-through, substandard margins, and improper alignment can adversely affect reproduction.

In the unlikely event that the author did not send a complete manuscript and there are missing pages, these will be noted. Also, if unauthorized copyright material had to be removed, a note will indicate the deletion.



UMI Microform 1458135
Copyright 2009 by ProQuest LLC
All rights reserved. This microform edition is protected against
unauthorized copying under Title 17, United States Code.

ProQuest LLC
789 East Eisenhower Parkway
P.O. Box 1346
Ann Arbor, MI 48106-1346

© 2008

Robin Carol Putney

ALL RIGHTS RESERVED

APPROVED FOR THE DEPARTMENT OF ENVIRONMENTAL STUDIES

Dr. Katherine Kao Cushing, Chair, Assistant Professor,
Department of Environmental Studies

Dr. Gary Klee, Professor, Department of Environmental Studies

Dr. Lorne Todd Holyoak, Adjunct Professor, Dept. of
Anthropology and Religious Studies, University of Saskatchewan

APPROVED FOR THE UNIVERSITY

ABSTRACT

CUSTOMARY MARINE TENURE AND TRADITIONAL ECOLOGICAL KNOWLEDGE IN PALAU

by Robin Putney

This case study serves to document past conservation practices still valuable to Palauans and recommends their incorporation in future marine resource management. Employing ethnographic methods, Customary Marine Tenure (CMT) systems of Ngarchelong and Kayangel State villages are described. The extent of Traditional Ecological Knowledge (TEK) currently used and development goals of these communities in the face of rapid economic development are also examined.

Kayangel's and Ngarchelong's CMT by village is still valued by elders, but is no longer adhered to by younger generations. TEK is not necessary in fishing due to recent technological changes in gear, therefore much has been forgotten. Improved enforcement of state and national laws is urgently needed. Individuals value healthy reefs and believe that high end, low volume eco-tourism, operated to directly benefit villagers, will eliminate the need to fish to generate income. Elders also recommend increasing the number of MPAs within the Northern Reefs.

ACKNOWLEDGEMENTS

This ethnography is dedicated to the children of Kayangel and Ngarchelong. It is my hope that you sit with your grandparents and ask them much more about your reefs and family histories.

Instrumental among the many people who have helped guide my research are the staff members of the Palau Conservation Society, namely: Tiare Holm, Asap Bukurrou, Tino Kloulchad, Lerince Kelmel, Yalap P. Yalap, Scott Kiefer, Elizabeth Matthews, Bernie Keldermans, and Umai. Without their support and expertise regarding the Northern Reefs, this case study would not have been possible. I am also grateful for the friendship and hospitality of Rachel Dimitruk, Nica Umedib, Mike Palo and Myrna Palo.

In North America, Katherine Cushing gave me the encouragement to complete this project; Gary Klee supplied the inspiration to start my research; and Lorne Holyoak gave me much needed constructive criticism. My parents supplied me with endless love and support to return to Palau and accomplish my goal. Most importantly, my partner Joshua Mendenhall stood by me through months of fieldwork on the other side of the planet, supporting and encouraging my work.

TABLE OF CONTENTS

List of Figures.....	viii
List of Appendices.....	xi
List of Acronyms.....	xii
Introduction.....	1
Problem Statement.....	7
Literature Review.....	9
Research Questions & Objectives.....	15
Study System.....	17
Research Design.....	20
Data Collection.....	24
Data Analysis.....	26
Results.....	27
Chapter 1: Reef Ownership & Use.....	31
Chapter 2: Ngarangeseu.....	44
Chapter 3: Conservation Practices.....	52
Chapter 4: Taboo Seafood.....	60
Chapter 5: Marine Laws & Enforcement.....	63
Chapter 6: Canoes & Other Boats.....	79
Chapter 7: Fishing Methods.....	83
Chapter 8: TEK.....	94

Chapter 9: Sale & Consumption.....	104
Chapter 10: Future Development.....	114
Chapter 11: Summary and Conclusions.....	124
References Cited.....	129
Appendices.....	133

LIST OF FIGURES

Figure

1. Kayangel and Ngarchelong States, located at the northern end of the Palau archipelago.....	4
2. Palau has 36 conservation areas, as of March 2008.....	6
3. Palau's compact road, on the west side of <i>Babeldaob</i> , heading north toward Ngarchelong State.....	13
4. <i>Ngerukuid</i> Islands Wildlife Preserve, located within the southern lagoon of Koror State's Rock Islands.....	13
5. Coral dredging on the west side of <i>Babeldaob</i>	18
6. The eight channels of the Northern Reefs.....	19
7. Marine Protected Areas: Ebiil Channel Conservation Area and Ngeruangel Reserve.....	21
8. Four major trends from research questions consistently differ between past and present.....	30
9. <i>Dilong</i> and <i>Dimes</i> villages shared fishing rights within the lagoon of <i>Ngcheangel</i> Atoll.....	32
10. Division of <i>Ngkesol</i> reef between <i>Dilong</i> and <i>Dimes</i> villages.....	33
11. <i>Ngebei</i> , <i>Nberbau</i> and <i>Iebukel</i> villages are located on the east coast of Ngarchelong.....	36
12. <i>Kiuid</i> channel is located on <i>Tketau</i> reef.....	40
13. <i>Ollei</i> village owned the reefs from <i>Kiuid</i> Channel up to <i>Ngerael</i> reef and south to <i>Ngerteuel</i> reef.....	41
14. <i>Mengellang</i> village owned the reefs extending from <i>Oketol</i> dock including <i>Ngerteuel</i> reef.....	42
15. <i>Ngkesol</i> and <i>Tketau</i> reefs are open to subsistence fishing by both Kayangel and Ngarchelong.....	48

16. Reef fish caught within Kayangel lagoon February 7, 2007.....	50
17. Green turtle speared for Ngarangeseu celebration.....	50
18. Men scaling fish next to Kayangel dock.....	51
19. Woman preparing large yellow taro.....	51
20. Double outboard engines make travel from Koror to the Northern Reefs faster and safer.....	60
21. A Palauan woman wearing money bead.....	63
22. PNCC telecommunications tower at Kayangel dock.....	69
23. Boathouse at <i>Ngerbau</i> village dock.....	70
24. Waiting platform at <i>Ngerbau</i> village dock.....	71
25. Boats moored at <i>Ollei</i> port during high tide.....	76
26. A similar structure built next to Ebii Conservation Area may deter poachers at night.....	78
27. Model outrigger sailing canoe displayed at the Palau Pacific Resort.....	80
28. Mengellang fisherman poling his bamboo raft.....	82
29. Fish traps were set between rocks.....	83
30. Materials for making spearguns are now widely available.....	86
31. Arc-shaped trap used by fishermen in Ngarchelong.....	89
32. Fisherman loads ice chest, monofilament line and bright plastic lure on outboard engine boat.....	93
33. The tropical almond tree.....	103
34. The breadfruit tree.....	104
35. Boat moorings in <i>Dimes</i> village.....	105

36. Gasoline prices in Palau, February 2007.....	106
37. The Palau Modekngei Corporation Incorporated sells fresh fish and produce.....	108
38. Reef fish sold in Koror.....	109
39. The Blue House Market is located in downtown Koror.....	109
40. Small white beach clams sold in Koror.....	111
41. Chopped sea cucumbers sold in Koror.....	111
42. Four live grouper holding pens within Kayangel's lagoon.....	112
43. Pacific Live Fish Company's mother boat and two "banana boats" moored in Kayangel lagoon.....	113
44. Kayangel's perimeter road.....	115
45. Water pipe laid next to road in <i>Dimes</i> village.....	116
46. Truck brought to Kayangel to construct recent water, electricity and road projects.....	117
47. Bungalow in <i>Dilong</i> village with water catchment tank.....	118
48. Trash piles contain items that cannot be burned.....	120
49. Recycling bin made by Kayangel Elementary students.....	120
50. Poachers illegally fishing Ebiil Conservation Area.....	124

LIST OF APPENDICES

Appendix

1. List of Informants.....	133
2. Interview Instrument 1.....	134
3. Interview Instrument 2.....	137
4. Palauan Glossary.....	140
5. IRB Human Subjects Letter.....	144
6. Transcript Coding Example.....	145

LIST OF ACRONYMS

TEK.....	Traditional Ecological Knowledge
PCS.....	Palau Conservation Society
MPAs.....	Marine Protected Areas
CMT.....	Customary Marine Tenure
PICRC.....	Palau International Coral Reef Center
C3.....	Community Conservation Coordinators

INTRODUCTION

Over the past two centuries, Palau's culture has rapidly transformed in response to the introduction of technology and ideas from Europe, Asia, and North America. With these changes have come new demands on marine resources and shifts in their management, both sudden and gradual. Traditional leadership had been a main source of the conservation ethic before European contact (Graham & Idechong, 1998, 144). European and American contact throughout the 1800's caused the Palauan population to drop significantly due to the introduction of smallpox and sexually transmitted diseases. Along with dramatic decline in the local population, came demoralization of the people. As foreigners appeared to prosper, locals endured hardships. Palauans considered new, foreign ways as better than their old ways (Barnett, 1960, 16). Chiefs' power declined and respect for traditional knowledge diminished (Force, 1960, 76).

The decline of chiefs' power was most severe during the Japanese administration (1914-1944) and with this came the highest degree of estrangement from traditional marine resource stewardship (Force, 1960, 86). Although many Palauans have retained much traditional knowledge, the Japanese effectively made people feel ashamed of local customs and replaced them with behaviors that suited their goals of a modern, developed Japanese society in Palau (Alkire, 1972, 14; Barnett, 1960, 16). Replacing customary stewardship was increased exploitation of raw materials, mainly fish, for export to Japan (Kitalong, 2002, 19). Profits earned by local laborers allowed them to purchase material goods. Prestige shifted from traditional harvesting of foods such as reef fish and taro to consumption of imported food products and foreign methods of governing fisheries. This

new potential to gain wealth also contributed in weakening the chiefs' hereditary power (Force, 1960, 85).

Christianity further undermined the right of chiefs to act as stewards of the land and sea by displacing the religious beliefs that underlay the old value system (Force, 1960, 78). Traditional leaders were respected as those who were thought to have descended from spiritual beings, making it possible for them to lead. The Modekngei religion, "a syncretism of Belauan shamanistic elements and Catholic doctrine and rituals," was developed in response to the rapid cultural change in the early 20th century (Machiko, 2002, 3). Followers of the Modekngei religion ceased to follow traditional seafood taboos, an indirect conservation practice, during this period. At the time of the 2000 Palau census, there were 138 people living in Kayangel State: 64% Modekngei, 10% Catholic, 14% Evangelical and 12% other. In Ngarchelong, there were 286 people: 34% Modekngei, 10% Catholic, 52% Evangelical and 3% other (Office of Planning and Statistics, Republic of Palau, 2000, 83). This shift in beliefs, especially in regard to chiefs' traditional authority to regulate fishing, further alienated many Palauans from reef and lagoon ecosystems by displacing moral controls on exploitation and a sense of connectedness with resources.

Although Traditional Ecological Knowledge (TEK), the accumulation of information regarding the biology and reproduction of an organism over many centuries (Silvano & Begossi, 2005, 44), has not been entirely forgotten, it continues to erode as globalized development of rural villages continues and new technologies in fishing gear are adopted. TEK is adaptable information passed on through generations using a particular resource

in a particular place (Berkes et al., 2000, 1252). Young Palauans increasingly move away from family land to attend school or get jobs in Koror and abroad and therefore do not work with and learn from community elders as generations of the past have.

Palau is known by marine ecologists and scuba divers for its rich biodiversity and high percentage of intact pristine ocean ecosystems. While healthy reefs are still a central value to many Palauan people, chiefs' control on a local level has not been the primary means to manage the use and conservation of these resources since the Japanese administration began in 1914. The creation of state and national constitutions, including state boundaries of reefs in 1981, at the urging of former U.S. President Eisenhower and the U.S. Trust Territory government, created confusion at the village level regarding who had the authority to punish poachers and enforce violations of past reef stewardship practices, state laws and national laws.

The national government's legislative branch has created natural resource policies since Palau signed the Compact of Free Association with the United States in 1994. The Republic of Palau's constitution has recently been amended to grant the sixteen state governments authority over marine resources within twelve miles of the high tide line (Graham & Idechong, 1998, 144). This case study will document past and present marine resource use and management policies of Kayangel and Ngarchelong States and their implications for future sustainability of the Northern Reefs (Figure 1).

Customary management practices have been incorporated into the western government model of the United States and are now enacted at the state, rather than at the national level, as they were during both the Japanese and American administrations.

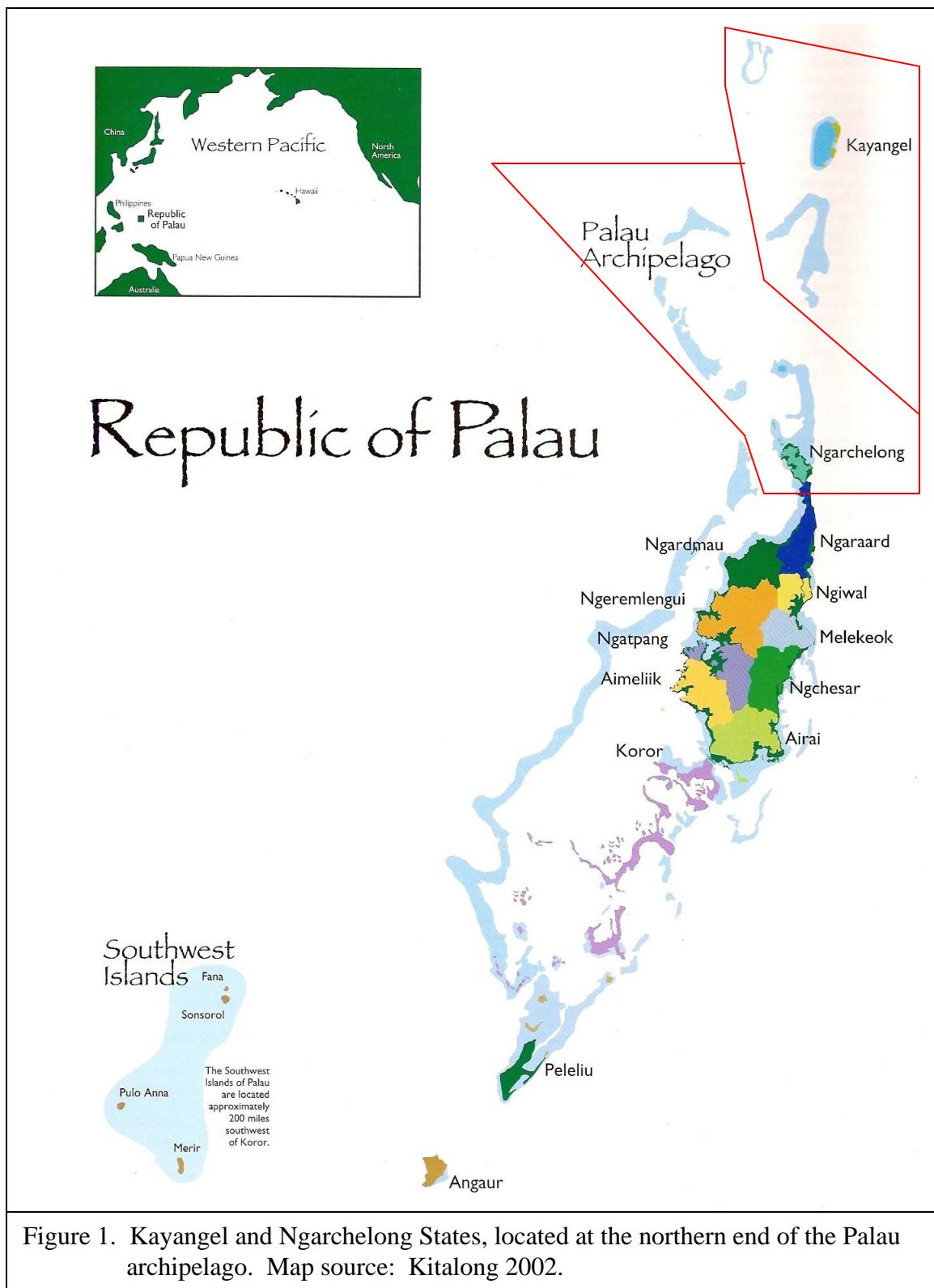


Figure 1. Kayangel and Ngarchelong States, located at the northern end of the Palau archipelago. Map source: Kitalong 2002.

Many state elected officials and traditional chiefs now work together, and often over-lap in their roles on natural resource policy issues. In both Kayangel and Ngarchelong States, members of the customary Council of Chiefs of each state serve in advisory roles to their respective state legislatures. The shift from National government control back towards decentralized control, at the state level, brings local leaders one step closer to the possibility of revitalizing the use of more traditional systems of management (Graham & Idechong 1998, 144). It is valuable now to determine to what degree elders are interested in preserving aspects of their villages' customary system of reef stewardship versus the chance to make money through development of coastal areas in planning for future resource management.

In line with global trends to protect the environment, Palau has become a regional leader in the establishment of conservation areas. In fact, Palau established one of the world's first modern Marine Protected Areas (MPAs), Ngerukiud (Seventy Islands Wildlife Preserve), in 1956. Since then, the Republic of Palau and state governments, with the assistance of the Palau Conservation Society (PCS), have created a total of 36 marine and terrestrial conservation areas (Figure 2). The MPAs have been designated to preserve the health of fish and invertebrate populations at varying levels of exclusion, from restricted seasons to no-take reserves. These MPAs are now managed by state governments with continued assistance from PCS through Community Conservation Coordinators from their respective states and regions.

On November 5, 2005, Palau's President, Tommy Remengesau, put forth a sub-regional agreement called the "Micronesian Challenge" to the leaders of each of the

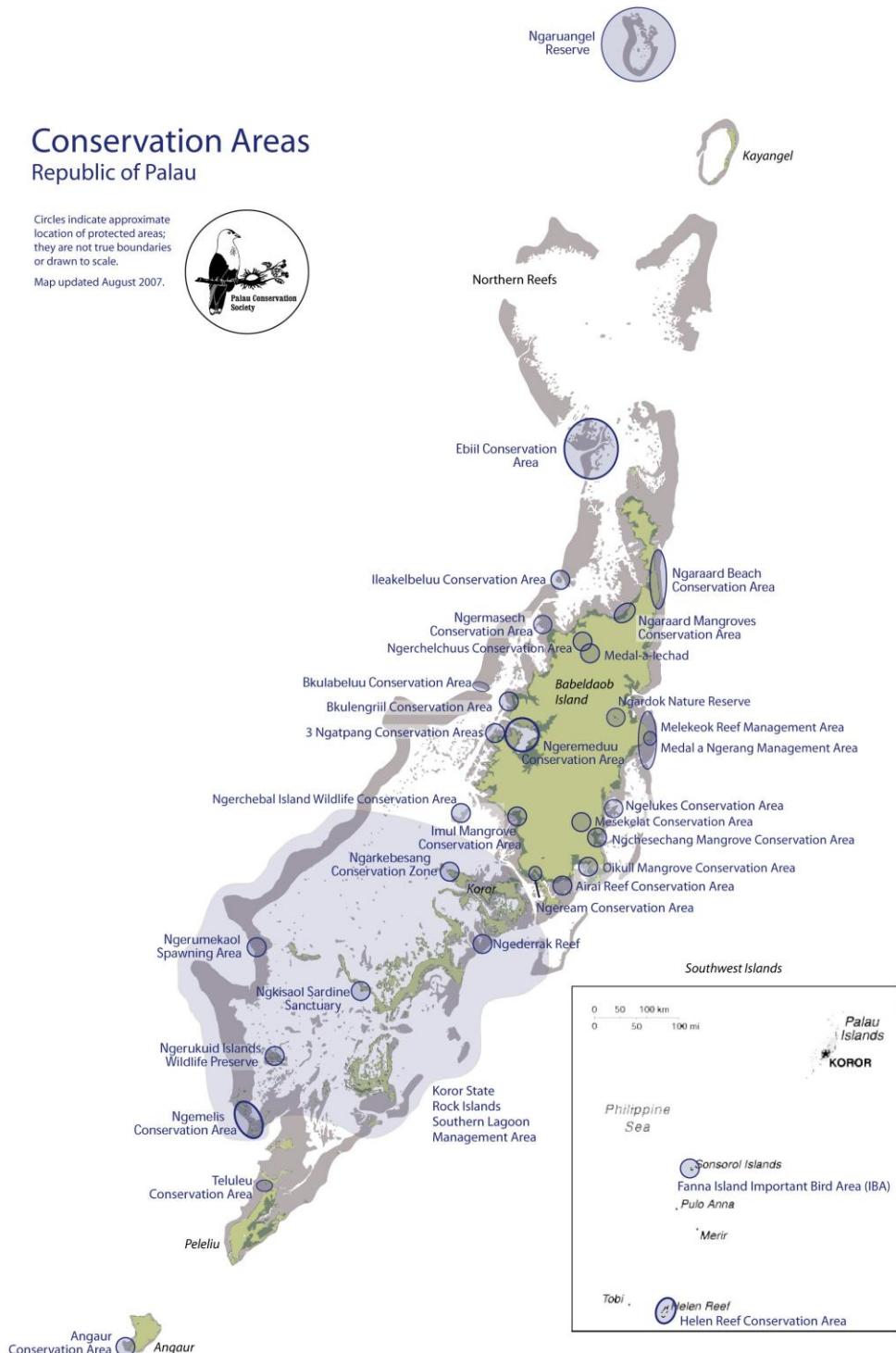


Figure 2. Palau has 36 conservation areas, as of March 2008. Map Source: Palau Conservation Society.

nations of Micronesia to designate 30% of their marine resources and 20% of their terrestrial resources as conservation areas by 2020. Palau's Ministry of Resources and Development has also recently enacted a Protected Areas Network to provide technical assistance to state governments, to act as a conduit for funding and to facilitate cooperation among the states in the management of marine and terrestrial conservation areas.

Palauans have effectively used MPAs in the form of Customary Marine Tenure (CMT), village-based ownership of reefs and lagoons, for thousands of years. Each village owned the reefs and lagoons directly in front of their land and outsiders were not permitted to fish there without prior permission from the chief of that village. However, with the erosion of customary tenure systems, due in large part to the western style of government, as well as globalization and rural development, resource managers are looking for a more comprehensive strategy in addition to MPAs to maintain healthy reefs and populations of important fish species such as grouper (Serranidae family), napoleon wrasse (*Cheilinus undulates*) and humphead parrotfish (*Bolbometopon muricatum*) (Golbuu, 2006).

PROBLEM STATEMENT

In managing the Northern Reefs of Palau, Kayangel and Ngarchelong States currently incorporate a blend of modern and traditional conservation practices. A case study of this system is valuable for both the future management of this area as well as for comparative studies with other fishing communities, especially those of the Western

Pacific region. As with many Pacific island nations, Palau is experiencing an extraordinary rate of development in response to globalization and increased tourism. Instant access to global information through the Internet, cable television and cellular telephones as well as widespread use of fossil fuel burning vehicles have all recently reached the daily lives of households in remote and rural villages. These rapid changes, in addition to the renegotiation of national U.S. Compact funding in September 2009, have created an urgency for Palauans to plan for an economically self-sustaining future. Resource managers, politicians and traditional leaders are deliberating over the extent to which customary ways of life and intact natural resources are of greater value than potential, temporary monetary gain.

The Northern Reefs serve as important seasonal spawning grounds for declining populations of valuable food fishes, including species of grouper: *tiau* (*Plectropomus areolatus* and *P. leopardus*), *mokas* (*P. laevis*), *ksau* (*Epinephelus polyphekadion*) and *meteungerel* (*E. fusoguttatus*) (Division of Marine Resources of the Republic of Palau, 1998). These resources have been over fished and are currently being poached. In the past, fishing communities used CMT, in combination with other restrictions, to limit poachers from outside their villages in order to avoid over-exploiting reef stocks and maintain stable fish and invertebrate populations. These systems are now used to a lesser degree due to the current western style of government, recent foreign resource exploitation, adoption of new technologies and a lack of marine law enforcement within Ngereangel Reserve, the Northern Reef Channels and Ebiil Conservation Area. The purpose of this case study is to document the extent to which TEK, CMT and other

conservation practices were used in the past and are still valuable to Palauans to enforce and maintain sustainable marine resource uses in the future.

LITERATURE REVIEW

There has been active dialogue during the past few decades regarding re-incorporating Customary Marine Tenure (CMT) into community-based fisheries management practices in the Western Pacific (Aswani & Hamilton, 2004; Cinner, 2005; Cordell 1993; Graham & Idechong, 1998; Johannes, 1981; Hviding, 1998; Ruddle et al., 1992; Virdin, 2000). Reef and lagoon tenure is the local ownership of the rights to fish in a particular area, maintained under the authority of village chiefs. Someone who is not a village member must seek permission from the chief before harvesting within the boundaries of that village. In Palau, each village owned the reefs in front of their land. Extensive barrier reefs and patch reefs surrounding the lagoon and forming channels between Ngarchelong and Kayangel changed hands in times of war.

This system of reef and lagoon ownership has been the most effective means for Pacific Islanders to sustainably use and manage their marine resources (Johannes, 1981, 64) and is based on the theoretical framework of a common-property approach (Ostrom, 1990, 30). Based on the idea of common-property, each fisherman has a vested interest in the reefs they fish since they depend on the long-term health of these ecosystems for their protein needs. This incentive for community-wide participation in resource conservation is being revitalized in parts of the Pacific in a shift back to decentralized co-management (Adams, 1998, 129; Gelcich, 2006, 952). In combination with MPAs and

other state and nationally enacted fishing laws, CMT is still utilized, to a lesser degree, by communities of Kayangel and Ngarchelong States.

For thousands of years, Pacific Islanders have accumulated local knowledge of marine ecology through oral tradition, observation and trial and error while fishing and collecting from reefs and lagoons (Berkes, 2000; Drew, 2005; Johannes, 1989; Klee, 1980; Moller et al., 2004; Silvano & Begossi, 2005). This information was not used in the Northern Reefs directly as a conservation tool in the past, but as a means to catch the largest amount of fish per unit of effort. TEK also taught people about their role in a given ecosystem and has recently been utilized, in combination with scientific research, in the formation of MPAs. This local knowledge, currently used to a lesser extent than in the past by fishing communities on the Northern Reefs, varies from that which was thoroughly documented for Ngaremlengui State by both Johannes (1981) and Klee (1972). This is due, in part, to differences in the political and environmental conditions affecting these two regions, as well as to the transformative political and environmental changes the Republic of Palau has experienced as a consequence of globalization during the past three decades and of becoming a sovereign nation in 1994.

In the Solomon Islands, Aswani and Hamilton (2004) documented TEK through participant observation and interviews with divers in the Rovina Lagoon. This information was used to create MPAs. Informants were chosen due to their status as spear fishing experts in their communities. These researchers interviewed elders who could provide data on changes in resource availability and fishing techniques through time, as did both Klee and then Johannes in Ngaremlengui, Palau. Likewise,

interviewees for this case study were selected based on their fishing skills and expertise.

Elders were also selected for this study because of their status in their communities and relationships with PCS Community Conservation Officers who collaborated with me to conduct interviews.

Palauans utilized a vast body of TEK in the past. Fisheries knowledge was a families' wealth and was therefore only passed on to other clan members. Palauans based their calendar on the lunar cycle. Fishermen were so in tune with the cycles of nature, especially the moon and tides, they developed specific tools for fishing effectively depending on the species, the time of the day, month and year and the weather conditions (Johannes, 1989; Klee, 1972). For example, if the currents or winds were strong, fish traps were more effective than hooks. The behaviors and life cycles of target species as well as their interactions with other organisms in the food web were considered when planning where and when to go fishing.

Over the past three generations, Palauans have realized that skills and knowledge are not being passed from elders and used by the next generation to the extent they were before the Japanese administration. Instead, people have been using new gear and technologies to harvest marine resources. Additionally, most young people are now attending school and working in Koror or abroad rather than living full-time in their families' villages. Therefore, most young people are not fishing and collecting consistently in the same areas their families have been for generations and many only have time to fish or harvest on the weekends. Customary knowledge is currently being recorded from elders by the Division of Cultural Affairs (Holyoak, 2001) and the Palau

Resource Institute. In accordance with the conceptual framework described by Barnett (1942), culture is a balance of maintenance and change. In order to balance Palau's cultural, environmental and economic futures, TEK should be considered in the policymaking process to improve future marine resource sustainability as it has proven to inform healthy fisheries management in the past. For example, people in Kayangel understood that sea turtles returned to the same beaches where they had hatched to lay eggs. In order to maintain a healthy population of sea turtles on their beaches, they only collected 100 turtle eggs of a nest of 160 eggs, reburying 60 eggs. There is now a law banning all turtle egg collection in Palau, nation-wide. However, poachers collect 100% of the eggs from any given nest now rather than 75% of them since state and national law enforcement is lacking and customary conservation practices have lost their authority to western-style laws.

Communities like those in rural villages of Kayangel and Ngarchelong, which have been displaced by jobs clustered in the economic center of Koror, can benefit from high-end, low volume eco-tourism, through dialogue surrounding rights and responsibilities of all stakeholders within villages. With the recent construction of the compact road, Palauans and visitors are now able to travel from Koror to every state in Babeldaob, regardless of the weather (Figure 3). In order for healthy reefs to continue to exist, communities must be able to manage resources together (Berkes, 2005; Jentoft, 2000; Johannes, 2002; Wilber et al., 2004). A current example of such a community in Palau is the management of Koror State's southern lagoon and Rock Islands (Figure 4).



Figure 3. Palau's compact road, on the west side of *Babeldaob*, heading north toward Ngarchelong State. Photo by author.



Figure 4. *Ngerukuid* Islands Wildlife Preserve, located within the southern lagoon of Koror State's Rock Islands. Photo source: Bill Perryclear.

As is the case with Koror's Ngerumekaol Channel Conservation Area, the system of reefs and eight channels between Ngarchelong and Kayangel States is one of the most important spawning grounds for many species of grouper, wrasse and other food fishes. Traditional leaders from these states agreed to close these channels in 1994 to fishing during the time of year when spawning aggregations are present, allowing fish stocks to replenish the surrounding reefs. Researchers from both the Palau International Coral Reef Center (PICRC) as well as PCS have recently completed substrate, coral and fish population surveys of these channels in order to determine the effectiveness of the Northern Reef Channels and Ebiil Channel Conservation Areas (Holm Pers. Comm., 2006). These reefs may be a draw to scuba divers, snorkelers and kayakers in the future like the Rock Islands of Koror are now. The challenge for the fishing communities of Ngarchelong is to improve enforcement of illegal poaching and to manage their reefs using scientific monitoring, technology and TEK.

The more development proceeds, the better infrastructure will exist to support the tourism industry. However, the new compact road, which now circumnavigates Babledaob, will bring visitors to the rural and, in many ways, still traditional villages in Ngarchelong, changing the economy and culture of these fishing communities (Holyoak, 2001). It may also make it possible for people to move back to their villages and to commute to work in Koror and the new capital of Melekeok. If this occurs, people may spend more time fishing close to home with their families, providing more enforcement against poachers and therefore, more stability and vitality to CMT systems.

RESEARCH QUESTIONS & OBJECTIVES

This case study will describe the relative importance of CMT and modern MPAs to the elders of Kayangel and Ngarchelong States using the theoretical framework of a common-property approach for sustainable management of marine resources. TEK relating to fishing and collection of marine invertebrates will be documented along with future goals for resource conservation. The following research questions guided this study:

1. Which reefs were owned by the villages of Kayangel and Ngarchelong in the past?
 - a. How was marine resource use enforced at the village level?
 - b. To what extent did people recognize and respect chiefs' authority regarding management of marine resources?
2. What level of marine tenure is currently being employed by villages of Kayangel and Ngarchelong States?
 - a. Which areas are being used by villages of Kayangel and Ngarchelong?
 - b. How is marine resource use enforced at village, state and national levels?
 - c. To what extent do people recognize and respect chiefs' authority regarding management of marine resources?
3. To what extent do people of Kayangel and Ngarchelong States currently use TEK?
 - a. How often are younger generations fishing with family members in areas their village used in the past?

- b. How do the ages, education levels and religious beliefs of interviewees affect the level of TEK they possess?
 - c. Are interviewees willing to share TEK related marine resources with non-clan members?
4. What are the development goals of elders from Kayangel and Ngarchelong States?
 - a. To what extent are people interested in preserving Customary Marine Tenure systems?
 - b. What do interviewees believe will be the impacts of economic development on the health of marine resources?

In order to answer these questions, information was primarily gathered during interviews with elders from the fishing communities of Kayangel and Ngarchelong States. Data was also collected, in part, through participant observation in working with the PCS Marine Team and Community Conservation Coordinators to monitor the MPAs in the Northern Reefs and through review of publications of the Bureau of Arts and Culture. This study will:

- Graphically represent villages' past ownership of fishing areas;
- Describe past and present enforcement of marine resource use and management within the Northern Reefs;
- Explore the extent to which TEK is currently transferred between generations and how Palauans view future use of this information in managing fisheries;

- Examine future goals of elders regarding preservation of intact cultural and natural resources versus development to increase earning capacity.

STUDY SYSTEM

The Republic of Palau is located 741 km east of Mindano, Philippines and 1,300 km southwest of Guam. The average temperature is 27°C with 82% humidity, year round. Rainfall averages 15-20 cm/month during the dry season (February – April) and 25-64 cm/month during the wet season (May – January). Five hundred and eighty-six islands comprise four types: volcanic, uplifted limestone islands, low platform islands and reef/atoll. Kayangel State is an atoll located at the northern end of the archipelago and Ngarchelong State is located on the opposite side of the Northern Reefs from Kayangel, at the northern tip of the largest, volcanic island, Babeldaob.

Palau's marine ecosystems are extraordinarily biodiverse and have historically provided the people who live there with the majority of their protein needs. For example, 1,350 species of fish have been recorded in Palau, more than anywhere else in Micronesia. One reason for the uniquely rich marine ecosystems is the relatively low human population compared to the expansive area of coral reefs surrounding the archipelago. Additionally, Palau is located along the convergent edge of the Philippine Plate and Pacific Plate boundary, which form the Palau Trench. Upwelling currents from over 8,000 meters deep bring nutrients to the corals and phytoplankton of Palau's reefs and lagoons, providing the base of the food web (Kazou, 2004). Palau supported a human carrying capacity of about 50,000 for 4,500 years before European contact

(Childress, 1988). At the time of the 2000 census, there were only 13,209 Palauans and 5,920 non-Palauans living in Palau, dispersed over a land area of 1,940 km². In Kayangel and Ngarchelong States, there were 124 and 259 Palauans, respectively (Office of Planning and Statistics, 2000). Although Palau is now one of the least densely populated nations in the world, current environmental threats to marine ecosystems include over-fishing and sand and coral dredging (Figure 5).



Figure 5. Coral dredging on the west side of *Babeldaob*. Photo by author.

Located between the land masses of Kayangel and Ngarchelong States is a vast reef system containing eight channels, which serve as vital spawning habitat for grouper and many other valuable food fish species (Figure 6). In recent years, these areas have been closed to fishing during spring spawning aggregations. Grouper are long-living fish with low reproductive fecundity. As a popular food fish, grouper have been unsustainably



Figure 6. The eight channels of the Northern Reefs. Photo source: LAN sat.

fished for export to Guam and Saipan and are now caught for subsistence and for sale in the live reef fish trade in Asia as well as in the markets of the district center, Koror, where three quarters of the population currently live and work. Over time, Palauans have noticed the smaller size of the grouper being caught. The decline in grouper and other

valuable food fish populations is of concern to local fishermen and conservation agencies alike.

The Republic of Palau annually receives substantial funding from the United States under the Compact of Free Association. From this national budget, each state receives the majority of their funding. According to Ngarchelong State Government Public Law 07-20, the state budget received from the national government in 2007 was US\$ 553,288. According to Kayangel State Public Law 9-2001-61, the budget for the most recent fiscal year available to me, beginning October 2001 and ending September 30, 2002, was \$260,400. These state budgets were appropriated for general operations and capital improvement projects and programs. The national Compact agreement will be re-negotiated in September 2009. The Republic and state governments will increasingly rely on the health of its marine resources for tourism in order to maintain the relatively high standard of living it enjoys compared with other island nations along the Pacific Rim. Currently, the average per capita income in Palau is just less than \$6,000/year (Office of Planning and Statistics, 2002).

RESEARCH DESIGN

In order to verify information derived from primarily from interviews, I worked as a participant observer with the PCS Marine Team while they assisted Kayangel and Ngarchelong States in monitoring the spawning aggregation site at Ebiil Channel Conservation Area and fish population densities at Ngeruangel Reserve (Figure 7). Additionally, I volunteered at PCS, working with the Marine Team on their Northern

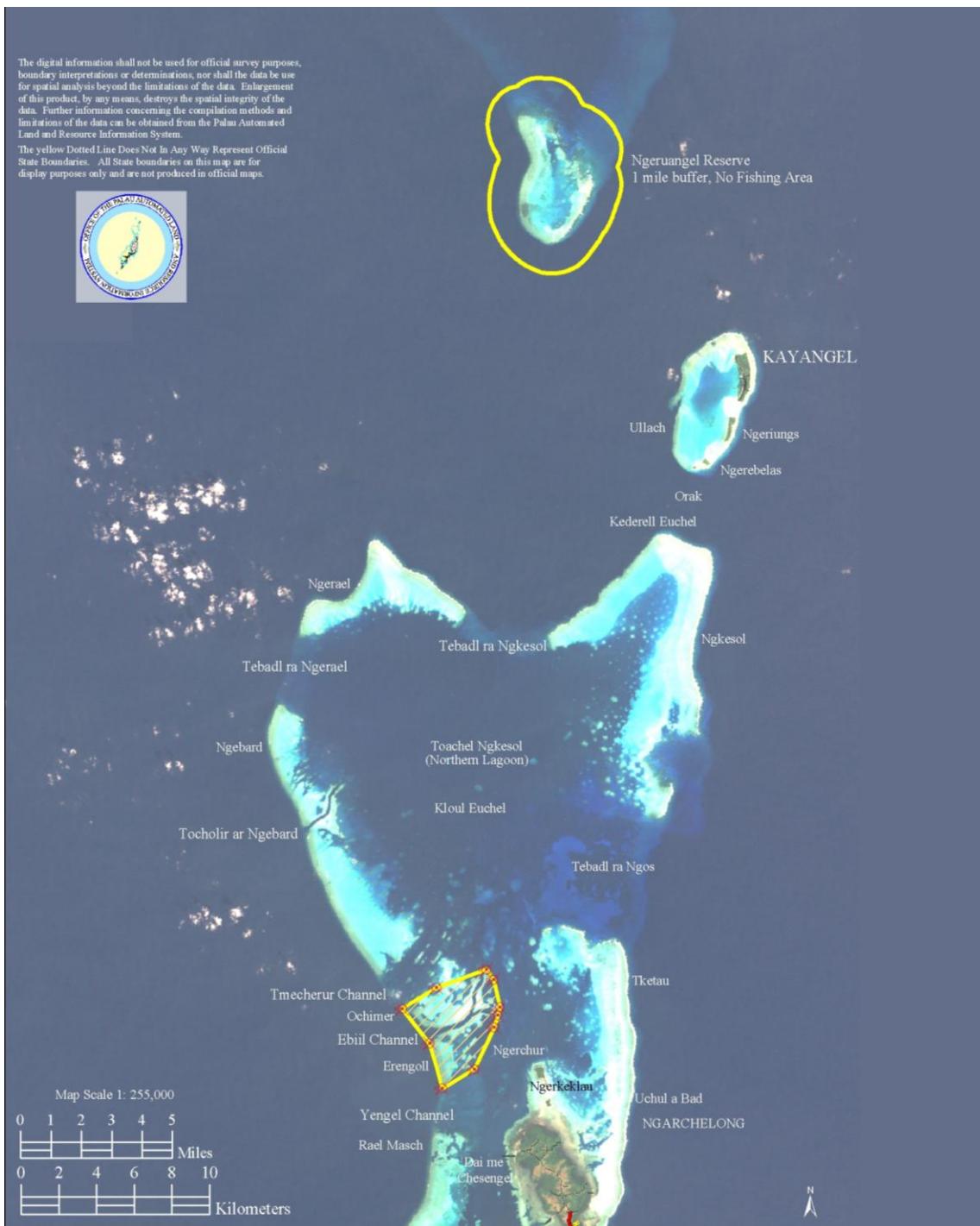


Figure 7: Marine Protected Areas: Ebii Channel Conservation Area and Ngeruangel Reserve. Image from Landsat VII, March 2003.

Reefs Baseline Biological Assessment. I traveled to my study sites in Kayangel and Ngarchelong States with PCS staff. Before data collection began, I met with the Governors of Kayangel and Ngarchelong States to introduce myself, describe the purpose of my study, and to discuss which elders could give the interviewees permission to talk before interviewing them. An interviewee might know something, but not feel that they have the authority to discuss knowledge held by their family unless they have been given the permission to talk to an outsider. Publications by the Division of Cultural Affairs, Palau Conservation Society, The Palau International Coral Reef Center and Division of Marine Resources were reviewed. Gaps in these collections of TEK regarding marine resource management of the Northern Reefs were addressed during interviews and observations.

With assistance from PCS Community Conservation Coordinators (C3), I interviewed 15 elders from Kayangel and 19 elders from Ngarchelong. These elders were referred by State Governors and PCS C3s due to their knowledge of fishing and collecting invertebrates, status in the community and relationships with C3s. In Palau, it is very important to find the right person within a community to ask the interviewees questions. If this individual is not a well respected member of a given community, the interviewee may not volunteer the information to them. I worked with C3s Tino Kloulchad and Lerince Kelmel as well as other PCS staff members during interviews with village elders from Ngarchelong and Kayangel states.

In the first of two interviews with each informant, individuals were asked to describe areas, using aerial photographs and maps of the Northern Reefs, which their village

owned in the past, and which areas were fished by their families. Interviewees were asked to describe areas historically and/or currently used by outsiders with permission from the chiefs/state government. Questions also focused on the political boundaries formed by traditional chiefs, State and National governments in enforcement and management of marine resources.

After verifying the translation of these initial interviews from Palauan to English and transcribing my notes, I arranged to meet for a second time with each informant. Questions explored to what extent TEK is still used and passed between generations, and whether informants are willing to share TEK with non-clan members for the purpose of planning future management strategies. The level of motivation for and value of re-establishing marine tenure systems based on a combination of traditional and scientific knowledge of natural systems and new technologies was also examined.

I conducted ethnographic field research in each village of Ngarchelong and Kayangel States in order to answer the research questions above. Through the use of interviews, I probed for the reasons people have retained and/or lost various aspects of their clan's traditional fisheries conservation methods. I also investigated the level of power traditional leaders still hold over marine resource use in comparison with local representatives in state and national governments. Male chiefs and women's leaders still exert influence over many customs practiced today despite the heavy western influences of capitalism and Christianity.

DATA COLLECTION

A total of 55 interviews were documented using an Olympus DS-2 digital voice recorder. Palau Conservation Society (PCS) Community Conservation Coordinators accompanied me during these interviews to act as both vouchers of support and translators. The first set of 34 semi-structured interviews focused on Customary Marine Tenure (CMT) of the Northern Reefs. Each informant was asked to name, describe and point out using satellite images, aerial photographs and maps, areas that were owned and/or used by their village historically. Using aerial photographs and maps, elders were asked to point to the reefs their village owned in the past. They were also asked which areas they fished or reef gleaned and which areas they shared with other villages. These areas were marked with a permanent marker, photographed and the laminated pages erased between interviews with rubbing alcohol. Interviewees were asked to describe the fishing rules and penalties when they were young. Boats and gear used to access the areas were discussed, especially changes in fishing during the Japanese, American and current Palauan Administrations. Interviewees were asked to describe past taboos and moratoria to document practices no longer used. Finally, interviewees were asked to describe current management of their reefs at village, state and national levels of government. This was to document changes in enforcement and people's attitude toward these changes (see Appendix 2).

Questions for the second set of 21 semi-structured interviews with each informant were refined through the analysis of the first interviews. During the second set of interviews, cultural domains, which appeared during the first set of interviews, were

defined through further probing questions. The second set of interviews asked elders to describe how they and subsequent generations in their families learned to fish.

Interviewees described their knowledge of fishing methods depending on the tides, the moon, animal behavior, plants as harvest indicators and weather. The diets of people's families were discussed and whether or not they thought fish from their reefs should be sold. Finally, people were asked to describe the development projects they would like to see in their villages. These questions were asked to further document people's attitudes and thoughts on changes in marine resource use over time and to inquire whether any past management practices may be valuable in the management future resource uses.

Open-ended questions focused on informants' goals regarding preservation of traditional knowledge and skills versus development to increase earning capacity. A dialogue of what TEK is passed on through generations, why, and to whom was developed to clarify whether people are willing to share this information beyond their families for the purpose of informing MPA legislation (see Appendix 3). Translation and transcription of this second set of 21 interviews was carried out in the same way as the first set of 34 interviews.

Since I worked as a volunteer with PCS during the four months of field work (January 2007 – April 2007), participant observation while working with the Marine Team in the Northern Reefs was on-going through-out the period interviews and transcription occurred. This participant observation allowed me to triangulate data from interviews with information gathered in field notes from informal conversations with

PCS staff, state government employees and community members. A document review of TEK recorded by the Division of Cultural Affairs was also completed during this period.

DATA ANALYSIS

Qualitative data collected through ethnographic research methods were coded into cultural domains to formulate a grounded theory (LeCompte and Schensul 1999: 151). Transcribed interviews and field notes from structured and unstructured observations were inductively reviewed for patterns that have meaning and significance to Palauan informants. Cultural domains, or codes, were selected based on original research questions and redefined throughout the data collection process as interviews and field notes were coded continuously, as they were gathered. These domains were defined in a list of codes to avoid using different connotations, denotations or morphing of the meaning of these words. Domains used in analysis included: conservation, enforcement, ownership, use, taboo, canoes, fishing methods, Marine Protected Areas, Traditional Ecological Knowledge (lunar, tides, weather, animal behavior and harvest indicators), fishing gear, sale and development. Codes were then sorted for comparison between past and present management practices. In studying TEK, reoccurring responses from informants were used to determine cultural domains that are valuable to interviewees (Silvano and Begossi 2005; Aswani 2005).

Cultural domains that appeared during the first set of interviews were examined further during the second set of interviews using semantic relationships to define the domain in terms of the Palauan interviewees. As the second interviews were coded,

themes emerged. These themes were inserted, line-by-line, next to the text within my transcribed interview documents (see Appendix 6). On-going discussions after interviews with PCS Community Conservation Coordinators, present during interviews as translators, increased the reliability of field notes.

RESULTS:

Interviewees were selected for this ethnographic study based on their knowledge of fishing and reef gleaning as well as on the rank of their family within their respective villages. These qualifications gave these elders the authority to speak about fisheries management and conservation to an outsider. When conducting ethnographic research in the Republic of Palau, it is imperative that a community member accompany the researcher and ask the questions during interviews with elders. Therefore, Palau Conservation Society (PCS) staff members, from Kayangel and Ngarchelong States respectively, assisted the researcher during interviews. The PCS Community Conservation Coordinator (C3) from *Ollei* village of Ngarchelong State, with close ties to Kayangel State, and the C3 from *Dimes* village of Kayangel State initially assisted the researcher in selecting the list of interviewees for Kayangel State. This list of interviewees was then presented to the Governor of Kayangel State for further advice and approval. The interviewees from Kayangel State were selected in equal numbers from each village, *Dilong* and *Dimes*. A few interviewees are from both villages and most of these elders hold close ties to the people of *Ollei* village of Ngarchelong State (see Chapter 2).

The interviewees from Ngarchelong State were initially selected by the C3 from *Ollei* village and then verified by the Governor of Ngarchelong. Nearly half of the interviewees from Ngarchelong State are from *Ollei* village with close ties to the people of Kayangel State. Two of these interviewees are also from Kayangel State. Three Ngarchelong interviewees are from *Mengellang* village, two are from *Ngebei* village, two are from *Iebukel* village, two are from *Despedall* (general term for the east coast villages: *Ngebei*, *Iebukel* and *Ngerbau*), one is from *Ngril* village and one is from *Ngeiungel* village. This strong bias toward *Ollei* village in the data collected for Ngarchelong State is intensified by the fact that interviewees who are relatives of the C3 were more likely to speak openly about their knowledge of fisheries management than those outside the C3's family and village. Therefore, the interviews with elders from *Ollei* village were longer and included more detailed answers in general. Additionally, the researcher conducted three *Ollei* interviews, and one *Mengellang* interview with informants in English, without the assistance of a C3 translator. During these interviews, the researcher had the ability to ask follow-up questions immediately, rather than waiting over a month to ask during the second interview, after the first interview's responses had been translated, and thereby generated much richer data.

Before the German Administration (1899 - 1914), *Ollei* village was separate from Ngarchelong. In order to administer the villages with greater ease, the Germans identified *Ollei* village with the seven villages of Ngarchelong: *Mengellang*, *Ngebei*, *Iebukel*, *Ngerbau*, *Ngril*, *Ngeiungel* and *Ngermetong*. This geographic re-organization continued during the Japanese Administration. After WWII, *Ollei* village tried to

separate themselves from Ngarchelong State, but Ngarchelong did not want to give up the extensive marine resources customarily owned by *Ollei*. Today, many people from both *Ollei* village and Ngarchelong refer to *Ollei* as a separate place, although *Ollei* village is included in Ngarchelong's state constitution. Many other people from *Ollei* and elsewhere in Ngarchelong State do refer to *Ollei* as part of Ngarchelong State.

In the following chapters, opinions, stories and direct quotations are not attributed to the interviewees who shared them in order to protect their privacy (see Appendix 1). Instead, quotes are credited to the state the interviewee is from. Since the villages where interviewees are from are relatively small, people live in close proximity to their family members and know their neighbors well. Because of this, people often know of each other's opinions regarding sensitive issues surrounding community resources. For example, between January and April of 2007, many people from Kayangel were very supportive of an oil exploration project located a few miles north of Ngeruangel Reserve with a 10% chance of success in locating an oil reserve. If found, profits from the extraction this resource could subsidize the relocation of Kayangel State's citizens, which is believed will be necessary in the future due to rising sea levels as a result of global warming. Others in the community are concerned about the possibility of the catastrophic effects an oil spill would have on marine ecosystems, a major source of food and fishermen's livelihoods. Therefore, while many interviewees spoke openly of their desire to have customary marine resource management practices documented, before they are lost, for the benefit of all future Palauans, the identity of informants in connection to information in this study is withheld to honor those who wish to remain anonymous.

Additionally, it should be noted that the Palauan language was transmitted orally before foreign administrations came to power in the late nineteenth century and information regarding fishing and reef gleaning was only shared within families. It is also in keeping with this practice that interviewees' names are withheld from the text of this manuscript.

Through the analysis of interviews and observation notes, four major themes emerge in response to the research questions: changes in reef ownership, reduced enforcement of fisheries laws, loss of TEK relevant to marine resources and little impact of development on healthy reefs (Figure 8).

Research Question	Past	Present
Customary Reef Tenure	<ul style="list-style-type: none"> • CMT by village • Respected by entire community 	<ul style="list-style-type: none"> • Western-style laws by state • CMT still respected by elders, not youth
Enforcement	<ul style="list-style-type: none"> • Chiefs' authority • Village youth clubs • Men watching dock • Entire community monitors behavior 	<ul style="list-style-type: none"> • State Government • State Police • State Conservation • Officers • Fish and Wildlife monitor behavior
Traditional Ecological Knowledge	<ul style="list-style-type: none"> • Wealth of family • Passed on through generations • Used to catch most fish per unit of effort 	<ul style="list-style-type: none"> • Not passed on through generations • No longer necessary to catch fish due to new gear and technology
Future Development	<ul style="list-style-type: none"> • No development 	<ul style="list-style-type: none"> • Little development/ maintain cultural and natural resources • Low-volume/high-end tourism • Increased MPAs

Figure 8. Four major trends from research questions consistently differ between past and present.

CHAPTER 1: REEF OWNERSHIP & USE

Customary Marine Tenure (CMT) was used throughout the Western Pacific in the past, and is still used in today in places such as: Solomon Islands, Papua New Guinea, Yap and Palau. CMT is the exclusive ownership of fishing rights. In Palau, ownership was held at the village level and was an effective resource management tool in the past cultural context due to respect for elders and community. There was a vested interest in the long-term health of marine resources since they were the main source of protein. Each village in Palau owned the reefs in front of their land. People who were not from a particular village had to ask permission from the high chief of that village before fishing or collecting there. As the Northern Reefs are far more extensive than the land in Kayangel or Ngarchelong, there was an oral tradition of tenure by village, of the reefs and lagoons beyond those extending from each village. According to elders interviewed in February and April of 2007, reef tenure was strictly followed in the past, but has not been adhered to by many Palauans since Kayangel's and Ngarchelong's state and Palau's national constitutions were enacted in 1981. An interviewee from Kayangel said, "Initially when the constitution was adopted that's when all territorial waters of the village went under the State government so people stopped practicing that tradition."

Kayangel is currently comprised of two villages: *Dilong* (north) and *Dimes* (south). Each of these villages owned the reefs around their respective halves of *Ngcheangel* Islet in the past. The lagoon was open to fishermen from both villages (Figure 9). Many informants claimed that *Dilong*'s high chief, Redechor, also ruled what is now Ngeruangel Reserve and the northwest side of *Ngkesol* reef. (However, according

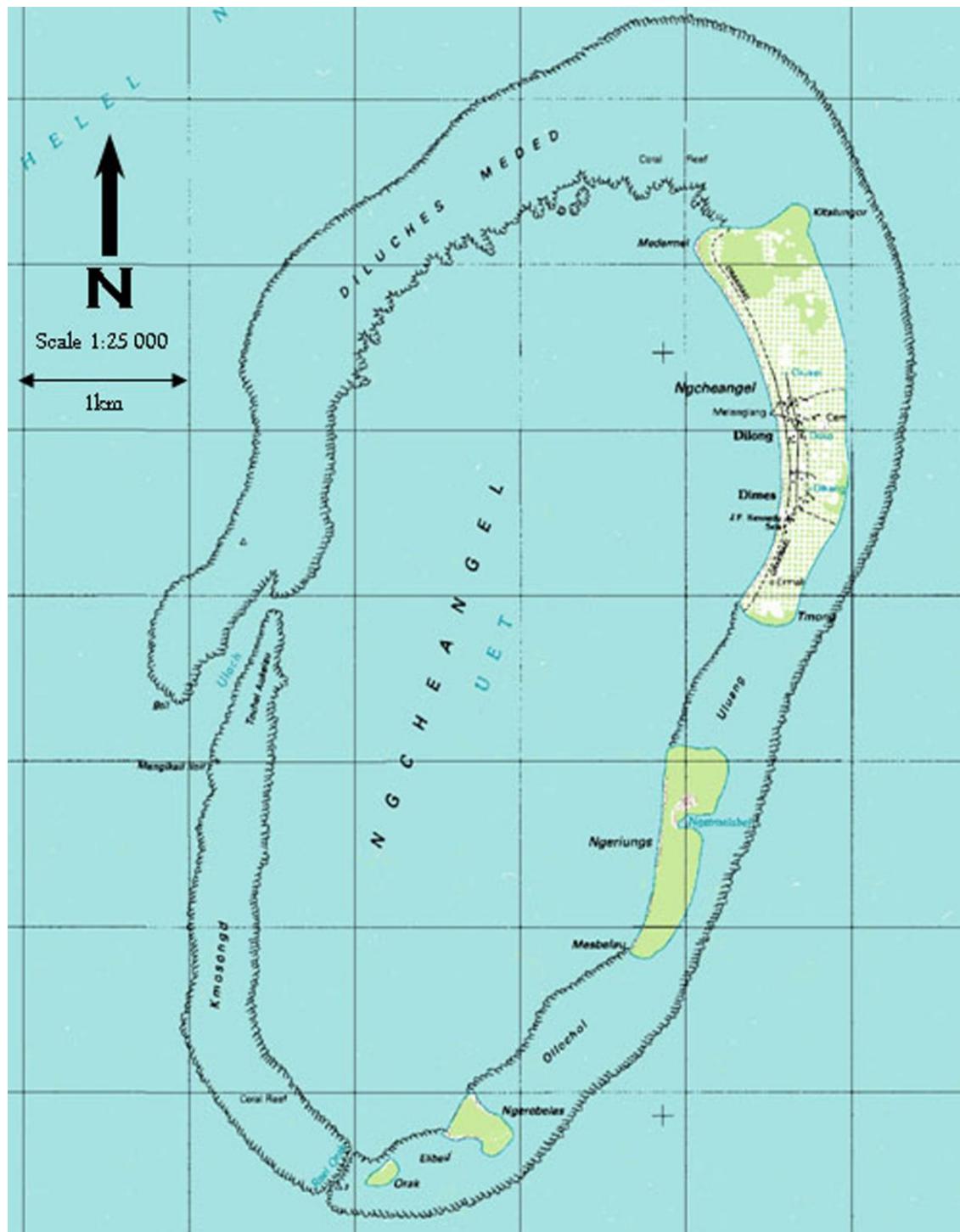


Figure 9. *Dilong* and *Dimes* villages shared fishing rights within the lagoon of Ngcheangel Atoll. Map source: U.S. Geologic Survey.

to one informant, *Ngeruangel* reef was public. This elder said that the people from *Dilong* village guided the people from *Dimes* village because *Dilong* is closer to the reef.) *Dimes*' high chief, Obakrusong, ruled the southeast side of *Ngkesol*, the dividing line on this reef stretching from *Tacheruuch* to *Mechutelchur* (Figure 10). In the distant past, *Dimes* village also owned the reefs *Ngerael* and *Ngebard*. These two reef systems were given to *Ollei* village by the high chief of *Dimes* after two separate battles in which *Dimes* asked the chief of *Ollei* to send Palauan money beads to pay off Ngaraard and halt



Figure 10. Division of *Ngkesol* reef between *Dilong* and *Dimes* villages.
Map drawn by Renguul Kloulechad, Ngarchelong State Historian.

their attack. First *Ngebard* reef, then *Ngerael* reef were exchanged for war-time assistance. People in Kayangel know that all the reefs in between them and Ngarchelong originally belonged to Kayangel because there is a story of the *mechas* (female elder), named Dirrabakerus who created *Ngcheangel* (Kayangel) and spread out these reefs and named them: “*Ngerdemuuch, Tmecherur, Ngebard, Ngerael, Ngkesol, and Ngcheangel.*”

There has been a very strong relationship between Kayangel and *Ollei*, beginning with the story of one of the gods of *Ngedebuul* (past name of Kayangel), feeling sorry for his village and wanting them to have *klechedaol* (visiting guests). The god of *Ngedebuul*, Ruchelmiich, envied the relationship *Ollei* had with *Ngeruangel*, celebrating together each full moon, and wished to start a relationship with *Delbirt* (past name of Ollei) by inviting them as guests to join *Ngedebuul* in a feast. Ruchelmiich found out when the next feast at *Ngeruangel* would be and then waited until that time to have his younger male siblings scatter flowers in the open ocean beyond the reef. When they saw sails from *Delbirt* coming, this god told his younger siblings to go stop the people from *Delbirt* and ask them where they were going. The people from *Delbirt* replied that they were going to a feast at *Ngeruangel*. The siblings of the god of *Ngedebuul* told them that the feast had ended the day before, pointing out the flowers in the water. They told the people from *Delbirt* that they should turn toward *Ngedebuul* and together they would have a feast. Then the people of *Delbirt* could leave the next day. The people from *Delbirt* believed them and agreed to join *Ngedebuul* for a feast. This was the beginning of the relationship between the villages, making it possible for people of Kayangel and *Ollei* to fish each other’s reefs for personal use when traveling from one village to the

other or when preparing for a custom. When typhoons wreaked havoc on Kayangel in the past, the people moved to *Ollei* until their homes were rebuilt in Kayangel and their villages surrounded by vegetation and productive reefs again. Because of these long durations spent in *Ollei*, some people from Kayangel still hold titles to land in *Ollei*.

Fishermen from Kayangel and *Ollei* used to meet at *Ngkesol* reef to collect *semum* (trochus, *Trochus niloticus*) or fish together. The people of *Ollei* prepared baskets of food (since they had enormous amounts of food compared with Kayangel as well as corrugated tin canoes when they became available) to trade with the people of Kayangel, who would bring especially well made outrigger canoes, carved from *klebau* (breadfruit trees, *Artocarpus sp.*), for the people of *Ollei* in the Southwest Islands style. Other times, *Ollei* and Kayangel collected trochus or fished together at *Ngeruangel* or *Ngerael* reefs. If the weather became windy, fishermen from *Ollei* would stay at Kayangel for 2-3 days. Then, fishermen from Kayangel and *Ollei* would sail to *Ngkesol* to see each other off. Kayangel and *Ollei* were like one village, with many families belonging to both places.

The only other villages informants knew of who were permitted to fish Kayangel's reefs were *Ngerbau* and *Ngrilil*, both located on the east coast of Ngarchelong State (Figure 11). In the past, *Dimes* village assisted *Ngerbau* village in war by bringing them *sibechngor* (name of a piece of Palauan money). This relationship between *Ngerbau* and *Dimes* continued with *klechedaol* (guests invited to visit another village) in *Ngerbau* including the high chief of *Dimes*, Redechor.



Figure 11. *Ngebei*, *Ngerbau* and *Iebukel* villages are located on the east coast of Ngarchelong. Map source: U.S. Dept. of the Interior Geologic Survey.

Before WWII, the Japanese Administration divided the ownership of the land and reefs to suit their needs, including exporting fish to Japan. During this time, *Ngkesol* reef was redistributed to *Ollei* village. The Japanese also redistributed a large portion of the reefs owned by *Mengellang* village. *Rael Masch* reef was given to Ngaraard State in exchange for Ngaraard's land being redistributed to Ngardmau State. After the War, the American Trust Territory government, headquartered in Saipan, again redistributed *Ngkesol* and *Ngerael* reefs back to Kayangel in the Trust Territory Charter agreement. During this period, people of *Ollei* and Kayangel continued to share a close relationship. The villages helped each other with community projects such as establishing copra plantations in both Kayangel and *Ollei* and clearing reef channels for boats and schools of fish to pass safely through during low tide.

During the trochus harvest at *Ngeruangel*, a few fishermen from *Ollei* were invited to join people from Kayangel. On the way home, people from *Ollei* fished *Ngkesol*, but only for personal consumption, never to sell. Another example of this close relationship between *Ollei* and Kayangel is from long before the Japanese Era. People from Kayangel fishing at *Ngebard*, *Ngerael* or *Ngkesol* reefs were called to *Ollei* by fires built on areas of high elevation during an emergency, such as in the event of a death. In 1981, when State and national constitutions were enacted, state lines were drawn such that Kayangel re-acquired *Ngkesol* reef and Ngarchelong, namely *Ollei*, re-acquired *Ngerael* reef. People from Kayangel and people from *Ollei* thought both *Ngerael* and *Ngkesol* reefs should belong to their respective villages. "It's still an argument today that cannot be resolved," according to an elder from Kayangel. As I spoke with people from

Kayangel, I found that most interviewees did not feel that they had the authority to talk about reef tenure since many people are still sensitive about the subject and the people from *Ollei* and Kayangel still hold very close ties. People did not want to jeopardize interpersonal relationships by discussing controversial reef ownership, especially not on an individual basis. However, if I had arranged to meet with a large group of elders from each village, they may have felt more comfortable expressing their thoughts with each other in front of me.

In an interview with an elder from *Dilong*, he told me that when Kayangel and Ngarchelong were negotiating the state boundary line through the Northern Reefs, people from *Ollei* asked the people from Kayangel for *Ngerael* reef since there are more people living in Ngarchelong and fewer people living in Kayangel. Kayangel told Ngarchelong they could have *Ngerael*. However, people from Kayangel are still allowed to fish there and sell their catch in Koror and in the live reef fish trade in Asia.

The people of Ngarchelong used fish traps most commonly to catch fish before the Japanese Era. There were specific areas of the reef where each family set up their traps. “One cannot just go anywhere in the reef and set a fish trap because there are particular areas designated for the fish traps of a certain family or house,” said an elder from Ngarchelong. The knowledgeable fishermen knew which areas particular species of fish used at particular times of the year and claimed these areas for their traps. An area was claimed by the first man to set their trap in a particular location. If another family from that village wanted to set their trap in that place, they would have to ask the first

person who used that spot. The reefs directly in front of a particular village were restricted to fishing only when the weather was rough and regular fishing was not safe.

Unlike today, where most people “go directly” to fish the reefs customarily owned by another village without asking the village chief or obtaining a state permit, “during traditional times, our fishing areas were separated,” said elders from Ngarchelong. They told of the story of a woman from *Ollei* village who was taken to *Barbikak*, part of *Ngerael* reef, and abandoned there because she was caught stealing taro by a man named Melngis. The woman’s son, Techochol was ashamed of her and took her out to the reef and left her there. Obakerbau of *Ngerbau* village found her while he was fishing and brought her back to his village. For this act, Techochol partitioned the reef channel named *Kiuid* as the northern boundary of the reefs owned by the village of *Ngerbau* (Figure 12).

In the past, fishermen from *Ollei* village most often fished the reefs from *Ngerchur* to *Ngerteuel*. During the Japanese Administration, *Ollei* owned the reefs north of *Delobech*: *Ileaklechei*, *Ngerteuel*, *Ebiil*, *Ngebard* and *Ngerael*, all the way around to *Kiuid* channel (Figure 13). People from *Ollei* and Kayangel shared fishing grounds and fished cooperatively in preparation for joint feasts and during trochus season. *Ollei* possessed a large, shallow harvesting area so they did not go to *Ngkesol* reef very often. When they did go, only a few fishermen went since the outrigger sailing canoes used were small.

Mengellang village owned the reefs on the west side of Ngarchelong in front of *Ochetol* dock, extending out to *Ngerteuel* reef (Figure 14). People of *Mengellang* fished

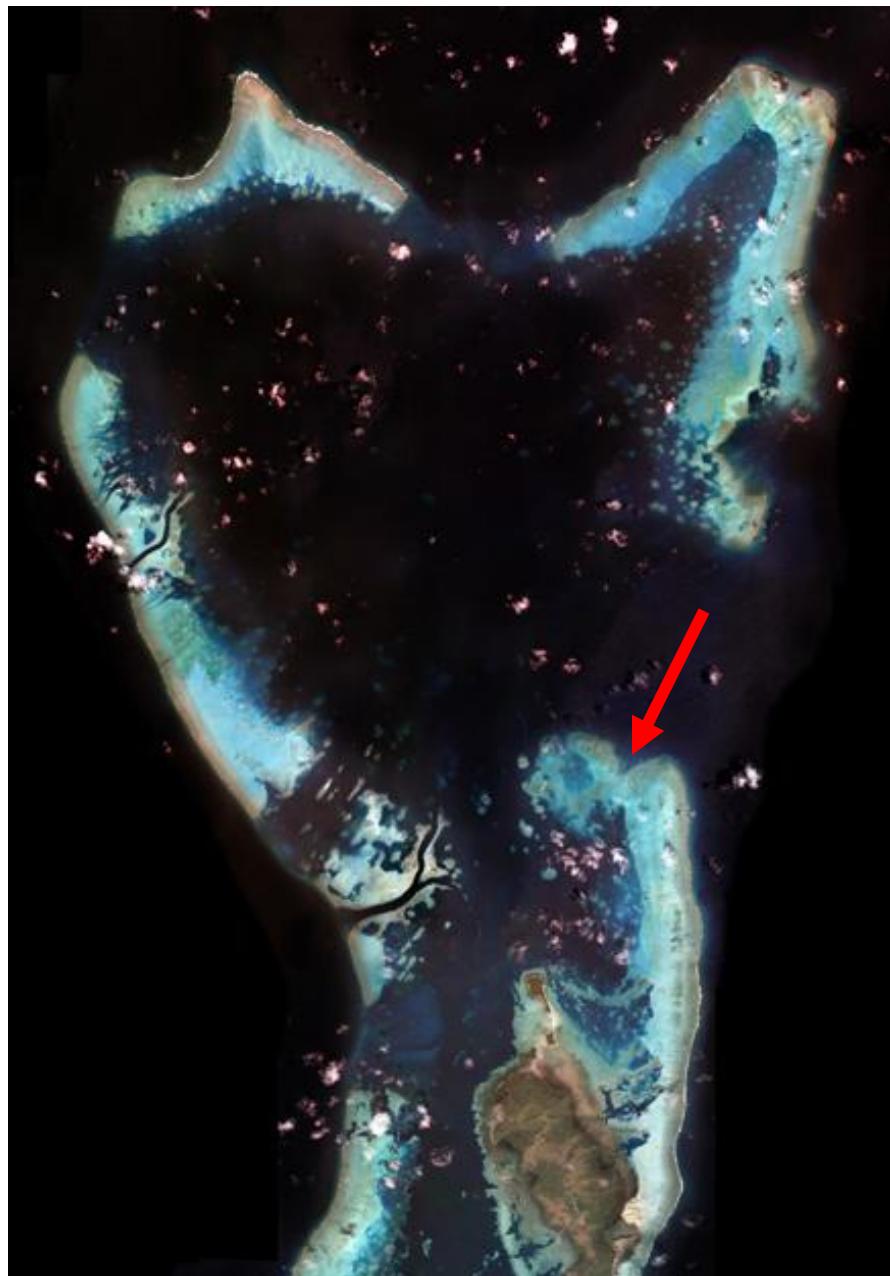


Figure 12. *Kiuid* channel is located on *Tketau* reef. Photo source: LAN sat.

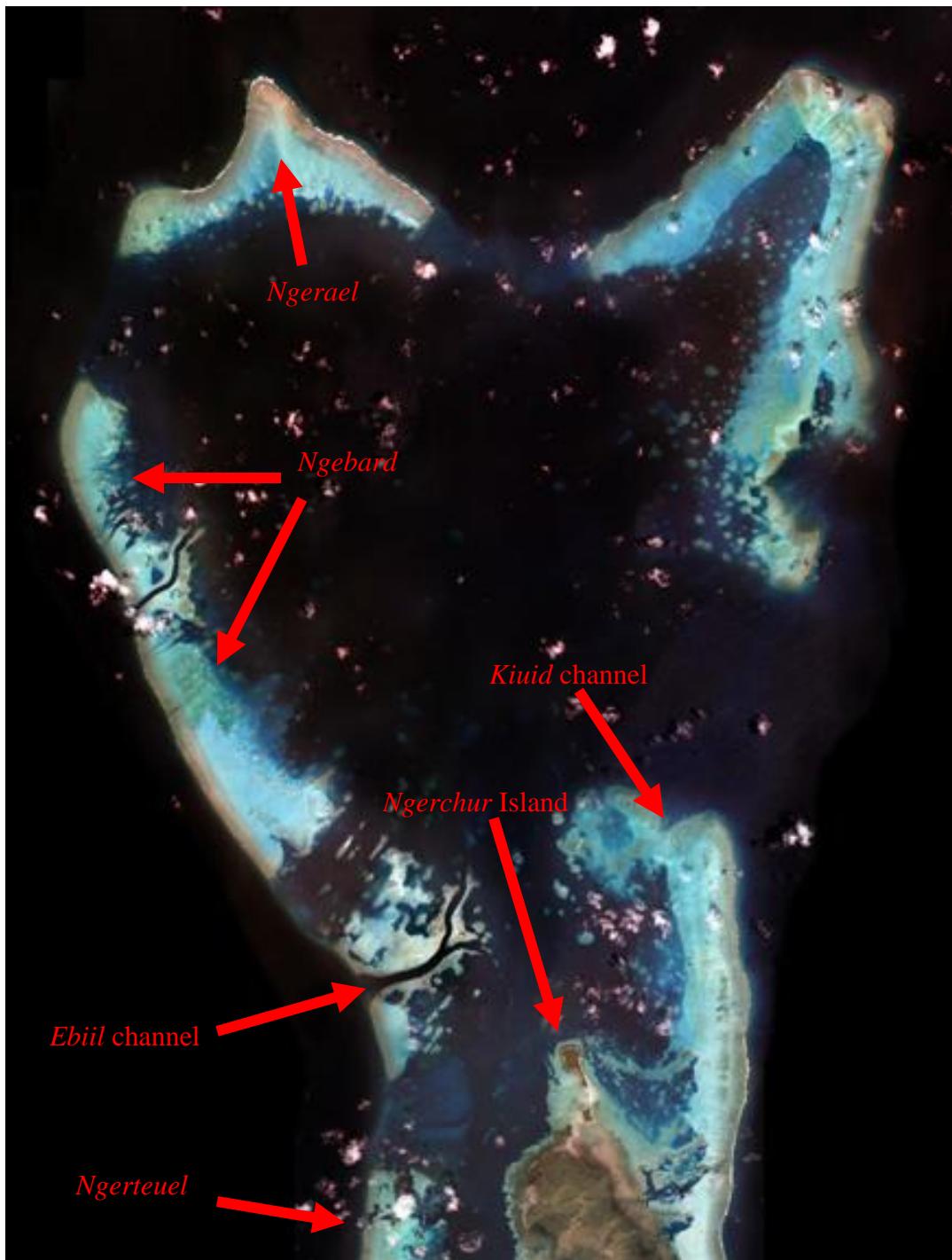


Figure 13. *Ollei* owned the reefs from *Kiuid Channel* up to *Ngereal* and south to *Ngerteuel*. Photo source: LAN sat.

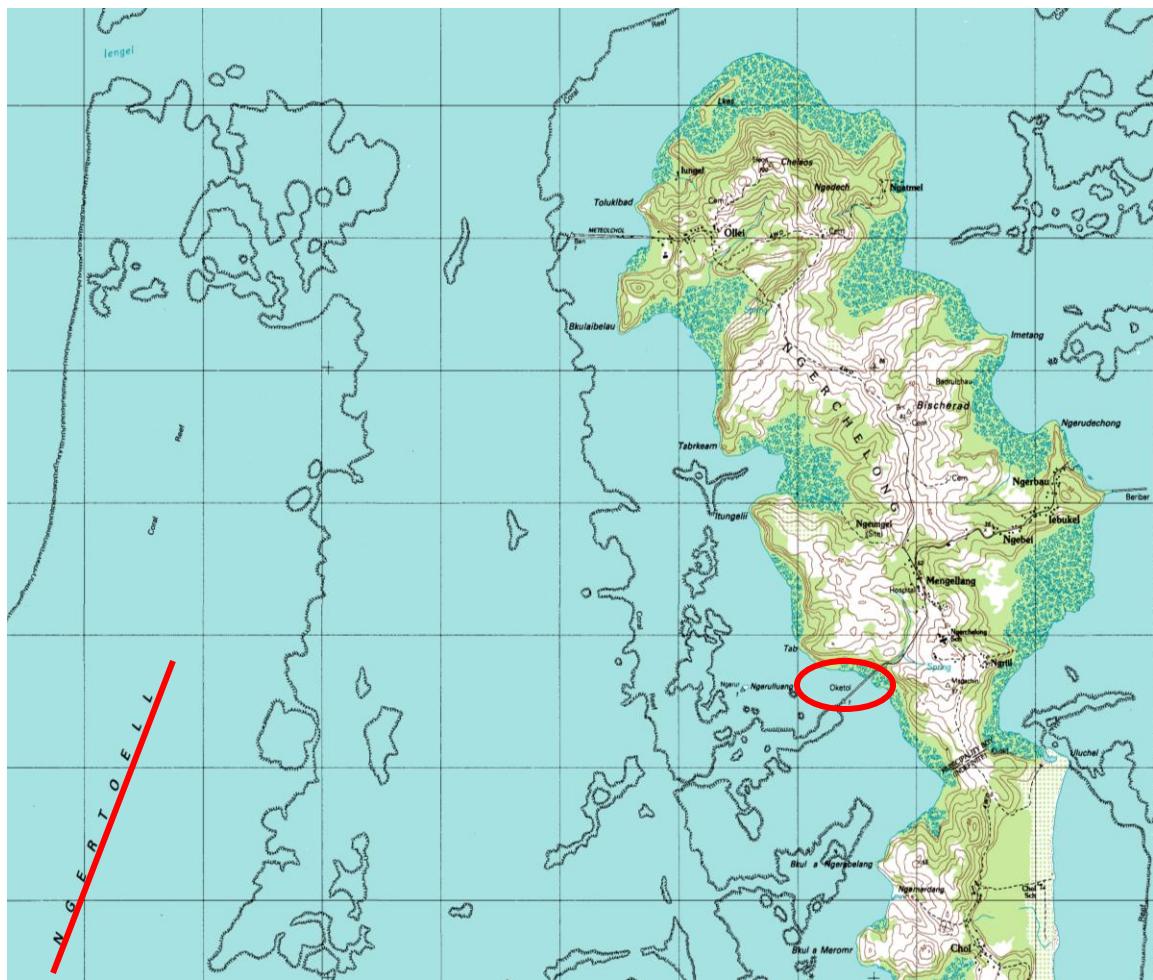


Figure 14. *Mengellang* village owned the reefs extending from *Oketol* dock, including *Ngertueul* reef. Map source: U.S. Dept. of the Interior Geologic Survey.

from the seagrass beds out to the barrier reef edge of the lagoon, but they did not fish outside the barrier reef during the Japanese Era since they did not have sailing canoes in the memories of the elders I interviewed. People from *Mengellang* most often fished at *Ngertueul* in the past. However, the Japanese Administration and the House of Traditional Leaders (14 high chiefs from the current states, besides Merir and Tobi States) took land from Ngardmau and gave it to Ngarchelong, and took reefs (part of

Ngerteuel) from Ngarchelong and gave them to Ngaraard. Now, Ngarchelong wants to take back their reefs and Ngardmau wants to take back their land.

During the years leading up to WWII, the east coast village of *Ngerbau* formed a close relationship with the people from *Dimes* village of Kayangel. According to an elder from Ngarchelong, “The Japanese period caused us to get closer and we became one.” These two villages are related, so people from either village can fish in each other’s reefs and lagoons for subsistence use. When people from the east coast villages went fishing in the past, they went out to the reefs in front of their villages on rafts or small sailing canoes. According to an elder from Ngarchelong, since people from the east coast villages had sailing canoes, people from *Mengellang* and *Ollei* villages joined *Iebukel* village to fish at Ngebard and Ngerael. He said, “when they went, it was not only one canoe but many canoes because it was too far. The chiefs did not allow only one canoe to go fishing that far by itself.” People of the west and east coasts of Ngarchelong also gathered together to fish using a large net of woven vines and palm fronds called *ruul*.

As a young person, one informant from Ngarchelong described collecting sea cucumbers and clams from the reefs on the west coast, around *Ochetol* dock and the rock island, *Ngerulerong*, just beyond this dock in the 1950’s and 1960’s. This elder described going to the east coast for land crabs and up to *Ngerael* reef with their uncles from *Ollei* and Kayangel to collect trochus. Other interviewees also described having relatives in other villages of Ngarchelong or Kayangel and the ability to fish anywhere within these two states for subsistence and custom use since WWII. Since the reefs are

now owned at the state level, anyone wanting to fish in an area belonging to a state they are not from must obtain a permit from the state office. However, many Palauans do not follow this law, especially when spearfishing at night, in the cloak of darkness.

CHAPTER 2: NGARANGESEU

In the past, Kayangel and *Ollei* village were very closely related, so there was no division in the use of the Northern Reefs between them. According to an elder from *Ollei*, "...they could use these seagrass beds of the ocean back and forth, because Ngarchelong and Kayangel were like one place." This was true until the Japanese Administration, which controlled Palau between the two World Wars, and which divided the land and reef boundaries, previously owned on a village level, for their own management and resource exportation purposes. For example, the Japanese supported a market for hawksbill turtle shells and fishermen from Ngarchelong would go to *Ngkesol* reef to hunt for these animals when the weather permitted.

Under the Japanese Administration, *Ollei* village was drawn as part of the district of Ngarchelong. After WWII, during the American administration, according to an informant from Ngarchelong, Kayangel separated themselves from Ngarchelong in the writing of the Palau Constitution. Kayangel became a separate state with their own government. Also at this time, *Ollei* officially became part of Ngarchelong State. During the 1970's, according to an informant from Ngarchelong, Kayangel started arguing that *Ngkesol* reef belonged to them. In an interview with an elder of Kayangel, it was said that in the 1982/1983 draft of the Trust Territory Charter, Kayangel's State line was

drawn to include *Tketau* and *Ngerael* reefs and Ngarchelong's State line was drawn overlapping this to include *Ngkesol* reef. The current state line, included in the 1981 State constitutions, is drawn so that *Ngkesol* reef is part of Kayangel State and the Northern Reefs from *Ngerael* to the south are part of Ngarchelong State.

The people of Kayangel and the people of *Ollei* started an organization in 1952 called Ngarangeseu to tie their relations. "From what we heard, the people of *Ollei* and Kayangel were related dating back to the ancient times," said an interviewee from Ngarchelong. Each month, the members of Ngarangeseu met to make plans regarding the work to be done, alternating the location of the meetings between Kayangel and *Ollei*. When the meetings were held in *Ollei*, the wives of the members from that village made food and brought it to the *abai* (community house). In Kayangel, the Ngarangeseu meetings were also conducted at the *abai* with food prepared by the wives of the Kayangel members.

In 1963, Ngarangeseu started the first credit union in Palau at the suggestion of one of the personnel from the Economic Office who had seen the idea on another island when traveling to the Trust Territory office in Saipan. This credit union was not only used to help fishermen in the purchasing of fishing boats and gear, but also in purchasing homes, land vehicles and for use in emergencies. After a couple of years, the two communities of fishermen gathered for a feast to celebrate what they had accomplished together, including their wives and children. After many people started working in Koror, in the 1970s, it became more difficult to get together each month, so meetings were held three times per year. In January, the meetings were held in *Ollei* because that

was the time when credit union documents were reviewed by the economic office. In February, Credit Union members met again in *Ollei* where the dividends would be dispersed. During this meeting, members also discussed who owed money to the union. In August, the meetings were held in Kayangel to discuss matters pertaining to Ngarangeseu's cooperative exchange and to remind those who still had outstanding debts to repay their loans or their collateral property, such as a boat, would be seized.

Another organization was formed between the communities of Kayangel and *Ollei* in 1960, called Ngaralei. This group formed to work cooperatively to clear land and plant coconut trees. People from Kayangel went to *Ollei* for two weeks to assist *Ollei* in preparing their copra farms. The Kayangel men stayed in the *abai* during this time and waited for the men of *Ollei* to fish for their food at night and for their wives to prepare the meals. When the men planted coconut trees, they plowed and made circular holes, approximately four feet in diameter and three feet deep. These holes were fertilized with coconut husks and grass and then coconut trees were planted in them. Planting trees in Ngarchelong was hard work, so only sixty to seventy trees were planted in each location.

In Kayangel, it was easier to plant new trees, because the existing trees were so close, seedlings were readily available, enabling the men to plant 100 trees in a day. In Kayangel, the wives of the men from *Dilong* and *Dimes* villages prepared the food for the men from *Ollei* and brought it to the *abai*. In Kayangel, the planting work also lasted for two weeks in one visit and then the men from *Ollei* went home. These cooperative plantings continued until 1964, but the Credit Union continues to this day.

One aspect of Ngarangeseu that has changed from the past is that the wives of the members no longer prepare the food. Instead, there is a food committee organized by the village hosting the meeting which finds and prepares the food and then reports how much the food costs. Each person donates between \$3 and \$5 for their dinner the following day after the meeting. A major change in the credit union regulations is that members can now only borrow based on the shares they have paid. At one time, the debts became great and people were not repaying their loans. Although some members opposed the change in union regulations, the Economic Affairs Office suggested that loans be based on a given member's shares paid to the account. Now, for example, if a new member joined with \$50, he could not borrow \$500 from the union as was done in the past. This credit union functions not only to help fishermen purchase new boats, outboard engines and gear, but also to help people build homes and other ventures.

From the 1970s onward, there was a dialogue between the men of Kayangel and Ngarchelong through which they decided that they would both be able to fish the Northern Reefs, regardless of their State boundaries. In this verbal agreement, it was decided that Ngarchelong could not sell their catch from *Ngkesol* reef, but only fish there for subsistence. In the same vein, Kayangel can only fish *Tketau* reef for subsistence (Figure 15). Citizens of both States can still fish toward the other and are not compelled to follow the state boundary between them, as Palauans from other states in the Republic are. An elder from *Ollel* village said, "...they then decided that they could go fishing back and forth, because we were the same people, but because the Americans have come, they have separated us, so it is like we are different, but we are the same so we can use

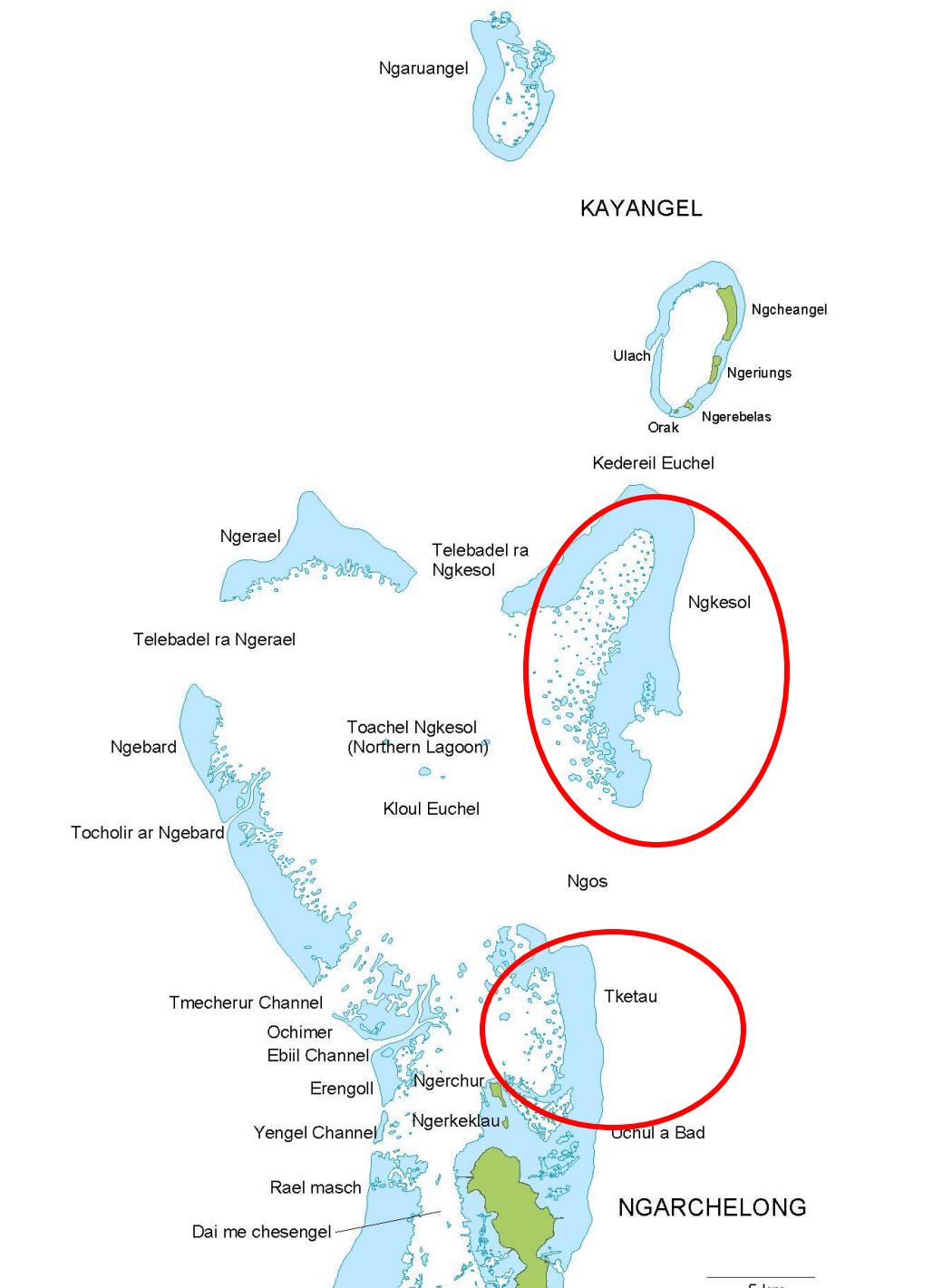


Figure 15. *Ngkesol* and *Tketau* reefs are open to subsistence fishing by both Kayangel and Ngarchelong. Map source: Palau Conservation Society.

the same sea grass beds to collect.” Many interviewees expressed a decline in use of Customary Marine Tenure systems during the American Era due to the rapid change from chiefs' authority over reef management to the western style of government at both state and national levels.

While I was visiting Kayangel in February of 2007 to interview elders, they hosted the annual New Year celebration between the communities of Ngarangeseu. In preparation for the feast, four boats containing a total of fourteen fishermen went fishing on the west side of the lagoon for reef fish such as *temekai* (grouper, *Cephalopholis miniata*), *keremlal* (red snapper, *Lutjanus gibbus*), *klesebuul* (rabbitfish, *Siganus lineatus*), *elebdechukl* (parrotfish, *Scarus ghobban*), *erangel* (unicornfish, *Naso lituratus*), and *bang* (goatfish, *Parupeneus barberinus*) (Figure 16). One boat with three fishermen returned after two and a half hours with approximately ninety pounds of reef fish. Two women came to meet them at the dock with instant coffee and (canned) tuna sandwiches. Ten minutes later, another boat of three fishermen returned to the dock with approximately one hundred pounds of reef fish. I observed a third boat return with an additional one hundred pounds of fish. The next morning, a thirty-five inch (carapace) *melob* (green sea turtle, *Chelonia mydas*) was speared for the occasion and one pig was slaughtered (Figure 17). The men of both communities spent the day of the feast cleaning and preparing these animals together (Figure 18). Women harvested and boiled taro and many other custom foods (Figure 19). A few weeks before the celebration, Ngarangeseu got together to clear *Kiuid* channel in Ngarchelong of coral rubble so that boats could pass through and also so that fish could more easily migrate through.

Approximately one month after the celebration, these communities joined together to clear the channel next to *Orak* Islet in Kayangel for the same purposes.



Figure 16. Reef fish caught within Kayangel lagoon February 7, 2007.
Photo by author.



Figure 17. Green turtle speared for Ngarangeseu celebration.
Photo by author.



Figure 18. Men scaling fish next to Kayangel dock. Photo by author.



Figure 19. Woman preparing large yellow taro. Photo by author.

CHAPTER 3: CONSERVATION PRACTICES

Fisheries management as we know it today was not necessary in the past since the fish were plentiful, diverse and easy to catch. An elder from Kayangel said, "That time, I think, there was no chance for fish stocks to decline because corals were good, fish habitats were good, and fish were plenty because fishermen strongly conserved." When men went fishing, they were able choose which fish they wanted to eat. Reef tenure by village was the primary method of conservation because everyone in a particular village relied on the health of the reefs for their family's future source of protein. Conservation was a way of life in the past, guided by village elders. When an elder saw something that was not right, they would tell the person to stop and not to do it again in the future.

Fishermen rarely broke the rules, according to an informant from Ngarchelong, because people in the past knew "what they were supposed to do and were good people." Emphasis was placed on the safety and success of the group rather than on the individual. For example, after harvesting the meat from a giant clam, fishermen would flip the shell over so others would not cut their feet.

In the past, young people were taught to fish or collect only what their household could eat. "Not like now that we go and catch excessively and put inside the icebox, so it stays there until it's not edible and we throw it away," said a man from Kayangel. People were necessarily conservative in Kayangel in the past due to the small size and remote location of the atoll. For example, children from one village were not allowed to go to the other village without asking permission from an adult. Including such societal rules, every aspect of life was closely controlled.

In the past, people in Kayangel collected turtle eggs. There was a *bul* set in place by the chiefs requiring people to count the eggs in the nest. If there were 160 eggs, women and children would return 60 eggs to the nest and only take 100 eggs home. If there were over 260 eggs, people would return 100 eggs to the nest and take the rest. This conservation measure ensured that some turtles would hatch and return to the island to reproduce again.

There was also a rule in the past that no food from Kayangel should be taken outside Kayangel. Instead, when people would sail to Babedaob, they would stop at *Ngkesol* reef to collect clams to bring as a contribution to the people they went to visit in Palau. People conserved marine resources in Kayangel by consistently following customs and not being careless. For example, people understood that to keep healthy population sizes of all species of fish, the juveniles need a chance to mature and reproduce. Therefore, fishermen would only take adult fish. According to an interviewee from the village of *Dilong*, men did not go out fishing everyday in the years just after WWII. They would catch what they could eat over a period of about three days and then go out fishing again once they had used all they had. In 1956, this meant taking about 15 fish during one fishing trip for one family.

At that time, there were enough fish in the lagoon that people did not have to go far to fish. People could paddle out in corrugated tin canoes in the lagoon and catch all they needed. Another man said, “It doesn’t have to be a long time, not even one hour fishing and we get our *odoim* (protein) and return.” In the first thirty years after WWII, people did not catch fish to sell them, only for subsistence and custom use. Now there

are not enough fish in the lagoon to fish there exclusively for subsistence. Kayangel State passed a law stating that fish caught inside the lagoon and within 500 meters of the outer reef of the atoll cannot be sold, only used for consumption. According to one interviewee, people should not continue to catch in excess of what they can immediately consume to bring back and store in their freezers. He said, "If we catch just to bring back and store, there's no way we can conserve. Instead, they should allow the fish to stay in the ocean until they need more to eat."

Another elder described a fishing expedition in Kayangel in 2006 that collected enough sea urchins to fill a cooler and then sold them in Koror. When he visits this location now, he cannot find any sea urchins and feels that this was a violation of the past moratorium forbidding people to take food out of Kayangel to feed other villages. He said, "Rubaks don't talk to the children that we have to conserve...maybe they don't care about these issues." Besides the weakening of chiefs' authority by the new western style of government, interviewees said that the younger relatives of the *rubaks* (men holding one of the ten ranking titles of chief) are not respecting the fact that their maternal uncles are present and that they should be humble and listen to their pronouncements. Instead, the young men are talking beyond the *rubaks*. Many interviewees felt that this social trend is a major contributor to the weakening of past conservation practices in Kayangel.

The Palau Conservation Society is currently conducting quarterly fish surveys of Ngeruangel Reserve. These surveys are conducted by Community Conservation Officers from Kayangel, Ngarchelong and other states as well as other PCS staff. Every three months, the Kayangel Conservation Officer drives the boat between set locations where

surveyors free dive along transects, and count the number of individuals of the ten species of fish most commonly caught by fishermen. Surveyors say that the fish counts are slowly increasing since this MPA has been closed to fishing and even entry. Corals bleached during the '97/'98 El Nino event also appear to be recovering based on observations by those involved in the fish counts over the past few years. This is a positive sign for future fish populations, since reef fish rely on healthy coral habitats for food and shelter.

The fish were plentiful in Ngarchelong in the past as well. Therefore, the only time people would sail from *Ollei* village to outer reefs to fish was in preparation for a customary feast. "The very front of the villages were off limits to anyone who was not from that village, not like now they just come in their cars and get off and fish," said an elder from Ngarchelong. Reef tenure was strictly observed in the past. Therefore, when a family from *Ollei* had close relatives visiting from another village and sharing everything with them, they still needed to ask the chief's permission before taking relatives fishing out on the village reefs. "Even if the law was just words we could not ignore it because when they said it was taboo, it was very strict and there was no compromising that word," said an elder from Ngarchelong. For daily protein, people went out with nets close to shore to catch rabbitfish and sardines. People also went out with lines and spears to catch the larger fish chasing the sardines in. However, when these *orwidel* (bluefin trevally, *Caranx melampygus*) became stranded on the shore, people would help them back to the water, knowing that the schools of sardines were

easy to catch because they were being herded to shore by the trevally. The reefs directly in front of the village were reserved for fishing only during rough weather.

None of the elders from Ngarchelong with whom I spoke recalled a decline in fish population sizes before the 1980s, when the sale of reef fish to Koror and buys in Guam and Saipan became a good business. People in the past only took what their family could eat before the fish spoiled. Now, according to interviewees, people take whatever they can catch, whether they need them or not. In the past, if a young person broke a verbally agreed upon law, they could be whipped by the chief who caught them and then again whipped by their parents, using vines. When a rule was broken in the past, anyone from that village who noticed would report it. People were afraid to break a village rule or act in a disrespectful manner because it would bring shame to their family. This respect for elders and the good of the community maintained a high conservation ethic among villagers.

Young people were not directly instructed, when they started to go out fishing outside the company of an adult, to bring home a certain number of fish. However, they knew that their skill in fishing would be judged by their catch. A man from Ngarchelong who loves to fish said, “Coming to terms that maybe they just want to see if we are better fishermen or if we were not and that after they remind us that although you are, but you have to learn to read about what is necessary.” Young men learned by bringing too many fish back to their village and being scolded for it, that it was their job to decide how many fish are needed and not to bring back more than that. If young men brought home too many fish for their family to eat, they were asked if they were preparing for a customary

feast. Simply being asked if they thought they took too much by adults upon their return made children feel ashamed of their actions. Additionally, children were publicly embarrassed by carrying the excess fish around to share with each house in the village. Through this learning process, young fishermen learned not to take more fish than their own household could consume.

Village leaders in the past conserved resources by setting a moratorium on their collection for a short period of time. The four highest chiefs in of a village would gather and to discuss restrictions on a particular organism or section of the reefs. The titles of these leaders in *Ollei* village, in order from the highest ranking are: Tet, Bedul, Ucherengos, and Remechesengel. The 5th chief in Ollei, Rteruich, served as the one to penalize people or as the messenger from the high chief to the head of each family. Word of a restriction was passed by the leaders of each family to everyone in the village. Palm fronds were tied around betel nut trees at each village entrance, both stone pathways and docks, to make all community members aware of a new restriction. Every person took it upon themselves to enforce a moratorium. In the late 1950's, *Ollei*'s leaders decided to place a moratorium on trochus harvesting from the south side of the *Ebiil* channel. Other villages set their own restrictions on trochus collection within areas of the reef customarily owned by them. These areas were marked with buoys. During this time, each village in Ngarchelong started their own trochus farms. *Ollei* collected seedlings at *Ebiil* channel for their farm. Once the population of trochus rebounded, seasonal collection at *Ebiil* was re-opened.

As a grown man, one interviewee from Ngarchelong went out spear fishing one morning and returned with seven *maml* (napoleon wrasse, *Chelilinus undulatus*) and some other fish. As he returned to the dock, the chiefs who were sitting there asked him if he was planning a custom or if he could consume all the fish by himself. They asked why he had to take all of the large fish normally reserved for big feasts. These elders also reminded the man that when he goes out fishing, he must be sure the coral habitat where the fish live remains intact. This informant was grateful that he received this verbal scolding because he never fished this way again. Unfortunately, he said that the chiefs do not question the fishermen anymore, due to their lack of authority under the western style of government.

When a few boats went out fishing with large nets in the past, such as *ruul* (see Chapter 7: Fishing Methods), the most experienced fishermen, would stand up on top of the boat and watch the number of fish being collected. Once there was enough to feed everyone, the master fisherman would shout to stop and open the nets. According to one interviewee from Ngarchelong, such roles of the customary village leaders have not changed, but people are not doing their jobs.

Many interviewees pointed out that the merging of the customary Palauan leadership and the American style of government in the early 1980's, was when conservation practices of the past began to cease. The Ngarchelong State government now creates laws regulating fishing, but this government is perceived not to understand the marine ecosystems and not to take sufficient action in enforcement of the laws by many of the elders I spoke with. Many of these government officials are thought to be

estranged from fishing and marine resources since they are not living and working in their villages, but now spend most of their time in Koror. Because of this change in government and lack of enforcement of state fishing laws, some people from Ngarchelong now catch as many fish as they can to sell in Koror in order to pay their bills.

One interviewee from Ngarchelong said that in the future, conservation will likely be centered around any organism or activity that could be used for economic gain. Another interviewee said that he still wants to conserve life in the ocean so that it will not be difficult to find food in the event of a storm. This elder believes that the decline in fish today is due to the types of gear used to catch fish as well as the jet action from fast boats killing fish eggs in shallow areas of Ngarchelong, such as seagrass beds. He also believes that the taking of too many fish by people, aided by new gear and ice, is causing the decline in the number of fish. These changes have made it possible to take 200 lbs. rather than 30 – 50 lbs. of fish in one day. Now that people have the ability to make money selling fish, outsiders poach the Ebiil Conservation Area at night, under the cloak of darkness. This no entry and no take reserve was too remote before twin outboard engines became available to many people (Figure 20). According to this elder, if only people from Ngarchelong fished Ngarchelong's reefs, then the fish stock would not be depleted as fast. He believes that if the government continues this way and there is no increase in chief involvement, the reefs will not be managed sustainably in the future.



Figure 20. Double outboard engines make travel from Koror to the Northern Reefs faster and safer. Photo by author.

CHAPTER 4: TABOO SEAFOOD

An indirect method of conservation in the past was due to the fact that each village and each house had a marine animal that was *delasech* (taboo to eat). For example, in Kayangel, the god of *Dilong* village was *duoi* (coconut crab, *Birgus latro*) and was not consumed. An interview said that if coconut crab were consumed by a person from this village, and the weather was stormy, it would continue to be stormy, making travel by boat unsafe. Another village in Kayangel, which was abandoned many years ago, called *Oreong* did not eat or harm in any way their god, the sea turtle. People in *Ollei* village of Ngarchelong did not eat *meai* (barracuda, *Sphyraena sp.*) in the past because it was the favorite fish of a demigod and thereby not for humans to eat. It was believed that if people brought this fish to their homes, they would become fatally ill

(Holyoak, 2005b, 28). In *Ngetmel* village of Ngarchelong people did not eat *matukeoll* (blacktip reef shark, *Carcharhinus melanopterus*) (Holyoak, 2005b, 38). Whether people believed these animals to be a totem ancestor, a god, or a guide animal to direct their way during travel by boat, these animals were not harmed or caught since they were taboo, and were thereby conserved. “In the past, every household in Kayangel each had its own god...mostly fish,” said an interviewee. People believed that if they did anything to hurt these animals, someone in their family would become ill or even die.

Most of the taboo marine organisms of the past are no longer adhered to or discussed because the majority of people in Ngarchelong and Kayangel follow the Modekngei religion. Over half of the elders from Ngarchelong and over eighty percent of the elders from Kayangel whom I interviewed are Modekngei. In 1922, the founder of the Modekngei religion, Tamadad, told his followers that the gods who had imposed the food taboos on them should be expelled and that it was safe to eat these foods, including those from the ocean (Machiko, 2002, p. 131).

However, there are still people in Kayangel and Ngarchelong who follow customary food taboos. The family of one interviewee still does not eat green turtle because they believe this animal directed their ancestors to Ngarchelong when they originally migrated. There is still a title passed on within a family from Kayangel, Remechesengel, who can divert typhoons and make swift ocean currents calm, but only when asked to. Additionally, if Remechesengel is stranded in a boat and carried away from Palau, he can find a way to make the boat return to land, provided someone asks him to. However, if this man is riding in a boat with many people and nobody knows that

he can do this, so nobody asks him, all may perish, but he will never do it. This elder follows the taboo associated with his title for four types of fish: *dech* (yellowstripe goatfish, *Mulloidichthys flavolineatus*), *chelas* (convict surgeonfish, *Acanthurus triostegus*), *rrai* (summer flounder, *Paralichthys dentatus*) and *olidiuarabong*. He is also forbidden to eat *brak* (large yellow taro, *Alocasia macrorrhiza*) associated with this inherited title. Not only does Remechesengel not eat these foods, he cannot eat anything cooked using the same utensils and pots that have been used to prepare these taboo foods before. Customarily, this title holder had a separate set of pots and utensils and the only person who could prepare his food was his wife. Due to these dietary restrictions, the title was turned down twice before being accepted the last time it was passed on.

A few informants from Kayangel made reference to the death of a relative in Ngarchelong who was riding his bicycle in the mid 1980s and fell off, fatally hitting his head. A relative of this man hit an *ochaeiu* (spotted eagle ray, *Aetobatus narinari*) while driving his father's boat through a shallow channel and then speared the fish. This man was related to the people in a village of Ngchesar State whose totem is the spotted eagle ray. The elders from Kayangel and *Ollei* village in Ngarchelong spread the word among family members at the time of this man's funeral to respect the spotted eagle ray and not harm it in any way. Because some taboos are still adhered to, the associated marine resources are still conserved by those who follow them.

CHAPTER 5: MARINE LAWS & ENFORCEMENT

It was the responsibility of every person in the village to report fishing violations in the past. The men's club of each village served as the constables of the chiefs and would enforce customary laws and tell the chiefs of any violation. If a person did not follow the customary reef tenure or a moratorium placed on a particular marine resource, they would be summoned to the *bai* (community house) for a trial. The high chief would listen to the questioning by the second and third ranking chiefs and then decide the penalty. If the crime was less serious, the person was asked to do community service such as cleaning the *bai*, stone pathways or dock. In the case of a more serious crime, a person's family would pay valuable Palauan money beads (Figure 21). If the



Figure 21. A Palauan woman wearing money bead. Photo by author.

family could not pay, they would make food for their clan's leader and wait until this chief paid the fine for them. When Palauan money was used to pay the penalty for a crime, it would bring shame on the entire family of the violator.

Interviewees in Kayangel did not recall any serious penalties for breaking marine laws enforced when they were young, in the 1940s and 1950s. However, many interviewees did experience a time when they had personally caught a large amount of fish and were scolded by their maternal uncles. The men would ask the young boys if they were planning a custom and then ask, if not, why they caught so many fish. The boys had to carry their extra catch around the village and distribute them to other households. They could not throw the fish away since they had already killed them.

According to interviewees from Kayangel, people from Kayangel and *Ollei* were the only Palauans sailing outrigger canoes after the Japanese era and before 1963, when Yanmar diesel engines were introduced. Therefore, there were not people from outside Kayangel and *Ollei* fishing Kayangel's remote reefs. People from *Ollei* only fished Kayangel's reefs when they were visiting to work on a project, because they had plenty of fish to catch from their own reefs. If people from *Ollei* were to violate a fishing custom in Kayangel in the past, the chief of *Ollei* would be summoned to pay the fine by the high chief of *Dilong* or *Dimes* villages, depending on where the crime occurred. Again, no interviewees had heard of any case where this happened. Another elder said that the moratoria set in Kayangel and *Ollei* were basically the same and that it was more likely when these temporary restrictions were violated by a person from *Ollei* in Kayangel, there would be a chief there who would remedy the offense without charging

any fines. The situation would also be dealt with in this same peaceful manner if a violation occurred in *Ollei* by a person from Kayangel.

Once Kayangel had a written constitution, in 1981, enforcement changed from being the responsibility of the entire village, led by its traditional leaders, to Kayangel State Government's responsibility. Since western style laws were written down and kept in an office, rather than exchanged verbally from the leaders to every person in a given village, they have become confusing and much less accessible. People no longer know if a penalty has been imposed or who should enforce the laws. "We don't have rules for the Northern Reefs. I can catch lots of fish ... and nobody can ask me about that," said one interviewee. There are both Kayangel State and national laws governing the fisheries, but citizens are unaware of them. There is now only one Conservation Officer and one police officer working for the Kayangel State Government. Rather than every person in the two villages watching and enforcing rules that protect the finite resources of their respective villages, so they will be available in the future, it is now the duty of two people to monitor everyone else. These two people must balance enforcing the actions of their family and neighbors with maintaining their relationships in a very small community. The Conservation Officer's position was paid by The Nature Conservancy when Ngeruangel Reserve was created in 1996, and is now paid by the Kayangel State government.

The Conservation Officer is the only person who can enter Ngeruangel Reserve, for any reason, without prior permission from the Kayangel State Governor in Koror. For example, before the Police Officer can assist the Conservation Officer, he must first ask

permission from the Governor before chasing poachers in the State patrol boat. For safety reasons, between two and three people should be present in such instances to operate the boat, radio and speak with perpetrators. When people are caught poaching this Marine Protected Area, or breaking any other state law regarding marine resources, they are fined between U.S.50 and U.S.250. Currently, people make so much money selling their catch in Koror, these fines are a small price to pay for getting caught and if caught, people will still make a profit after paying them. According to an interviewee from Kayangel,

Elders in this village, long time ago...villagers long time ago...got along very well. So when they get together and say we'll restrict an area of...restrict coconut crab, then *bul* is placed on coconut crab, no one got coconut crab. For they knew placing a restriction, [it] will multiply and will benefit us one day. It worked out because there was no sale of coconut crab...and sale of turtles. Now it doesn't work because all these are income so people look for their chances...that's why they're violated.

If a violator does not pay a State fine, the State may take them to the National Supreme Court. In such instances, the State often loses money in legal fees and usually does not put their case together with enough incriminating evidence to convict poachers. Instead, poachers who are guilty are often released on technicalities because evidence is non-existent or not well organized enough to hold up in the courtroom against the statements of Public Defenders.

Many informants described an incident of Kayangel State Government enforcement in which national government staff were caught poaching Ngeruangel Reserve (where both entry and fishing are illegal) in the 1990s. These men had their gear confiscated and held in Kayangel, however no one knew whether they had been fined.

This is an example of the confusion people have over the Western style written laws. At the same time, most informants believe that poaching is having a negative effect on reef fish populations. People are caught and fined in Kayangel for breaking marine related laws so seldom, the Police Officer, who files such violations with the Governor, is unfamiliar with the amounts of the fines. I was referred to the Kayangel State law book when visiting to interview elders in February 2007 and found that it had only been updated through 2001. In Koror, I was not granted access to read the more recent State Public Law files.

Palau National Hospital staff as well as staff working for a non-profit organization in Koror were observed fishing in Kayangel in 2007 without obtaining State permits. Some elders would like to see enforcement of Kayangel State restrictions strengthened to keep this poaching from occurring. Although these groups are traveling to assist Kayangel, there is concern that they will start selling Kayangel's fish in Koror if they are allowed to return with fish. The elders do not mind if outsiders fish in Kayangel and consume what they catch while they are there as long as they obtain permits first.

Life is much easier now in Kayangel State than it was in the past and punishments are not as strict. This is due, in large part, to the fact that village elders have lost much of their power and authority since the State constitution was enacted. For example, only 4 of 10 chiefs from each village in Kayangel serve as advisors to the state legislature in Koror. Now, young men speak out beyond the voices of the chiefs and many family leaders do not teach their children and grandchildren the conservation practices they grew up with. After the eighth grade, children move to Koror or abroad to attend high school

and therefore do not spend nearly as much time with elders as children of past generations did. The reduced time young people now spend with elders further contributes to their lack of authority in issues of reef management.

Most interviewees from both Kayangel and Ngarchelong States want to see the authority over reef management by traditional leaders strengthened. Elders expressed that the customs regarding marine resources have not changed, but now there are western-style state laws governing the same areas. In other words, there are two sets of rules for the same issue in many cases. An interviewee from Kayangel stated,

Now, this time, there are a lot of...let's look at the legislature, we don't...we Palauans don't need the elders because American influence have come...like senators. Just for this village there is a legislator, there is a governor. American rules are in effect, there is no more...it's like our Palauan identity is lost. And enforcement of rules is weak. Weak enforcement of rules so no...issues long time ago, we don't say they are weak, they're powerful but American rules...there are some that are in conflict. That's the reason why rules become weak.

Elders in Kayangel would like to see existing state laws enforced, and even suggested that more MPAs be created. Some interviewees suggested a rotation of closures on a 5 year cycle, alternating closure of one side of Ngkesol *reef* and then the other side. At the time I was conducting the first set of interviews, February 2007, this idea was being proposed to the Kayangel State legislature. Other interviewees suggested a rotation of closures between *Ngrael* and *Ngbaard* reefs.

In the near future there will be a radar unit, donated by the Palau Conservation Society, installed in Kayangel to monitor all boating traffic on the Northern Reefs. The radar system is primarily intended to be used against poachers fishing in Kayangel and

Ngarchelong States without permits, especially those poaching MPAs. It will also function to increase safety for all boaters by locating lost vessels in the event of rough weather. A telecommunications tower, approximately forty meters tall, next to the dock in Kayangel may be the best location to install this radar unit (Figure 22). Once the



Figure 22. PNCC telecommunications tower at Kayangel dock.
Photo by author.

radar system is installed, the signal will be capable of reaching approximately 80 km. Three Conservation Officers will be needed to operate the new radar system (an increase from one conservation officer employed by Kayangel State at this time): one person the office, monitoring the radio, phone and radar, and two people operating the boat. The

radar system will decrease Kayangel State's fuel costs by having people patrol only when the radar picks up an unknown boat.

In the past, when fishermen were polling their way home from fishing areas to the entrances of villages of Ngarchelong, they would sit and pole their rafts as they passed the mooring docks and then they would stand up again. This respect for community was the first law of the sea according to an elder from *Ollei* village. At the dock, children were not permitted to play in the canoe house where canoes were kept (Figure 23). The people of



Figure 23. Boathouse at *Ngerbau* village dock. Photo by author.

Ngarchelong in the past followed the Palauan tradition to catch only as many fish as their household needed. When fishermen returned to the dock, the chiefs would be sitting

waiting for them and would penalize them if they caught too much. Chiefs went to the dock early in the morning to count how many fishing boats went out. At least one man would sit at the dock all day to make sure that all the boats returned safely (Figure 24). If



Figure 24. Waiting platform at *Ngerbau* village dock. Photo by author.

not, they would send out a search and rescue mission deploying all able men and boats to find the missing boat. In return for guarding the health of the reefs and the safety of the fishermen, the elders at the dock were given a portion of the catch, a service called *tmang*. Since there is no one performing this service in Ngarchelong today, fishermen are not held accountable for their catch. In contrast, this practice is still carried out in Kayangel, however fish are now placed in a cooler (Holyoak, Gibbons, Miko, Besebes & Knecht, 2005a, 11).

According to one informant, “The ten chiefs of the community held power over everything such as policing matters all the way to judicial matters.” At times, the 10 chiefs of each village created a moratorium or temporary ban on collecting or fishing for a particular species, such as turtle or dugong, within their respective village’s fishing areas. The traditional leadership was totally transparent and all the laws regarding the ocean were followed. “It was not possible for the men to create a ban and the people would not follow it,” said an informant from Ngarchelong. For example, long ago, when there was a moratorium placed on hunting dugong, the type of fishing nets made for this purpose were all discarded. When such a ban was lifted, there would be a *sikes*, in which canoes would paddle together looking for turtles on the reefs at low tide. These turtles would be prepared for a customary feast to give notice that the ban on hunting dugong had been lifted. People hunted turtles only when the chiefs said it was permitted. For the people of *Ekidilas* (west coast) of Ngarchelong (*Mengellang*, *Ngril*, *Ngeiungel* and *Ngemetong*), this was normally during the dry season, between February and April, referred to as *ongos*, the time of the easterly winds.

In the past, when a Palauan from another village, for example, from *Ngebuked* village of Ngaraard State went fishing in the seagrass beds owned by *Mengellang* or *Olei* villages without permission from the chief or if they damaged something in that area, Tet, the high chief of *Olei*, and ultimate protector of the west coast fisheries of Ngarchelong, would go to *Ngebuked* and inform the high chief, Madrangebuked, of the penalty. If people from the villages on the east coast of Ngaraard, such as *Ulimang* or *Chelab*, fished along *Despedall* (east coast) of Ngarchelong, the high chief, Obakerbau, would penalize

them. In a circumstance where outsiders broke a rule, the Palauan money paid in the fine is named either *kluk* or *chelbuchebe* and was paid by the high chief of the offenders' village to the high chief of the village whose reefs had been violated. If the offender was instead a member of a local village in Ngarchelong, they also would be fined, but their maternal uncle or clan leader would be asked to pay the penalty in Palauan money, called *kldait*, to the high chief of their village. If a crime was deemed less serious, an adult would be made to do community service, such as cleaning the dock, the pathways or the *bai*. The offenders were often times present during the trial at the *bai*, whether they were an outsider or a village member, to hear the chiefs talking about the crime because this was one way they were taught what was right. In the case of a juvenile offender, the child would be whipped as punishment. If the young person did not tell the truth about what they did during the investigation, the consequences would be more severe.

The youth clubs in each village in Kayangel and Ngarchelong are made up of the young men and women who are next in line to be the chiefs and title holders of the village. Some of these clubs were charged with the security of their village in the past. One men's organization, which served as the constables for the rubak, looked up to their uncles or brothers who were the chiefs. The clubs watched over and did the work in the village. If a club wanted to do something, they needed to first seek permission from the chief. In cases where the chiefs did not grant permission, they would first discuss the situation and then would give the club a reason for why they could not grant their request. Because of this order of enforcement and hierarchy of legislation, everyone in the villages of Ngarchelong in the past was well aware of each decision made by the council

of chiefs. After a decision was made at the *bai*, the ten chiefs returned to their houses and explained what was discussed. Since the ten chiefs were the heads of the lineages of each community, each clan was directly informed through these leaders.

Since 1981, Ngarchelong has been governed by written western laws and led by a governor. “The governors have taken over the responsibilities of the chiefs of this community so now the chiefs don’t have any responsibilities so they’re under the governors,” said one interviewee from Ngarchelong. In the past, the Council of Chiefs of the whole of Ngarchelong did not directly manage marine resources. The reefs that belonged to the village of *Ollei*, for example, were managed by the ten chiefs of *Ollei*, called Ngaraderbei. The high chief would call the other nine elders of Ngaraderbei to convene to discuss any matters dealing with *Ollei*’s reefs.

The marine and terrestrial resources that long ago belonged to and were managed by the seven villages of *Ngerbau*, *Ngebei*, *Mengellang*, *Iebukel*, *Ngeiungel*, *Ngermetong* and *Ngriil* were separate from those of *Ollei*. During the writing of the Ngarchelong State constitution, Ollei officially became the eighth village and its land and ocean resources have been consolidated and are now managed as Ngarchelong State resources. The control of State resources is now held by the Governor above the traditional Council of Chiefs, who serve as advisors to the State Legislature. The State Legislature is composed of eight elected officials, one from each village, and is counseled by the eight traditional leaders, the high chief from each of the eight villages of Ngarchelong.

Under this Western style of government, people from Ngarchelong can now fish anywhere in Ngarchelong, excluding Ebiil Conservation Area, but need a permit to fish

or collect from the marine areas belonging to other states. However, some elders I spoke with still observe the customary marine tenure system and wish to see a return to village level ownership of marine resources. In the 1990s, there was a man who was caught fishing in Ngarchelong State, at the northern end of *Rael Masch* reef without a permit. His boat, gear and fish were seized at *Ollei* port and he was fined U.S.500. Since there is no trial at the village bai, people are unsure in these cases whether the fine was paid and the offender held accountable or not. There is confusion now because respect for the traditional division of the reefs is not followed by everyone and the traditional leaders do not have the authority to watch out for the safety and health of their communities and reefs as they did in the past. Laws are written in English and stored in office buildings.

Many informants expressed uncertainty about whether the enforcement of penalties has actually been followed through with since fines and court decisions do not take place in the village community houses and many of the people involved in a particular case now live in Koror. Now, moratoria are set in place by the state legislature, such as the law banning entry and fishing within the Ebiil Conservation Area. An interviewee from Ngarchelong said, “Ngarchelong and Koror, I think, have the most resourceful marine ecology. And I think we should be putting our efforts in preserving it for Ngarchelong.” An incident of law enforcement in Ngarchelong State in the memory of another interviewee was when national Fish and Wildlife officers were called on to monitor Ebiil Channel Conservation Area for people illegally taking trochus. There are currently no deputized Conservation Officers in Ngarchelong State to enforce such marine laws, so deputized National Fish and Wildlife officers must be called on to drive

up from Koror (In the past there was a Fish and Wildlife officer stationed in *Ollei*). The problem is that before these officials arrive, the poachers have plenty of time to get away.

Ngarchelong is known throughout Palau to have large fish stocks and many Palauans from other states poach the reefs at night. According to an elder from Ngarchelong, the government cannot catch them because they do not have a big, fast boat or the manpower to enforce the laws. The Palau Conservation Society donated a boat for monitoring and enforcement of the Northern Reefs to Ngarchelong, Kayangel, Ngaraard, and Ngardmau States, which is moored near the Ebiil Conservation Area at Ollei port (Figure 25). However, Ngarchelong State does not have funding to allocate for fuel to follow through with monitoring or enforcement of Ebiil Conservation Area. An informant from Ngarchelong said, “I think the State is not responsible, not doing enough



Figure 25. Boats moored at Ollei port during high tide. Photo by author.

to see the area is really being protected for the purposes we proposed [the conservation area]." Only deputized police officers can fine violators, but their salaries are so low, it is difficult for Ngarchelong State to keep marine Conservation Officers long after they have been trained. Additionally, in a small community of about 125 people, it is difficult to find someone who wants to work a job turning their family members and neighbors in for breaking the law. This may be the greatest obstacle in marine law enforcement in Ngarchelong, regardless of the level pay. If many people were to become involved in enforcement in the future, rather than placing the burden on a few State Conservation Officers, and the perceived status of deputized officers elevated, this problem might become less of an issue.

Everyone from a particular village informing on their fellow community members who violated the laws used to be an effective means of enforcement before inter-village marriages became more and more common in the 1970s. According to a retired Palauan high school teacher, it was not appropriate to tell on others if one's mother is not from that village. If your mother is from that village, you have the authority to tell on others. However, in the early 1980s, people started to carry more individual attitudes rather than being responsible, community-minded citizens, according to this retired high school teacher. Toward the end of the 1980s, transportation to Koror became much easier and many people moved there for work. With fewer community members living in the villages of Ngarchelong, there are also now fewer eyes to enforce the rules.

During trochus season, in recent decades, areas were marked with buoys where harvesting was off-limits for each village. The western villages, *Mengellang* and *Ollei*

each had separate areas that had been partitioned as off-limits. According to a man from Ngarchelong, it has been quite a long time since these areas have been partitioned as off-limits, except for the Ebiil Conservation Area, which is the same area that was marked off-limits for *Ollei* during past trochus seasons. In 2006, there was no enforcement during the trochus season and approximately half the people harvesting did so illegally, collecting from Ebiil Conservation Area. Many of these poachers were from Ngarchelong and knew that the area is marked by buoys as a no-entry and no-fishing zone.

One informant's suggestion to improve enforcement in the future is to build a bamboo raft with a small house on top, like those in the Philippines and Indonesia (Figure 26). The idea is that there does not actually have to be a watch person out there at all



Figure 26. A similar structure built next to Ebiil Conservation Area might deter poachers at night. Photo by author.

times, but it should be lit each night so that it appears that someone is there monitoring the area. This elder also envisioned a camera that would be attached to the raft to catch poachers in the act and facilitate their conviction in national court cases with concrete evidence. Many interviewees from Ngarchelong would like the traditional leaders to take a more active role in advising elected officials, “so that the traditional and western systems work hand in hand,” as one informant stated. This elder spoke of a government in the future where the western system no longer covers up or pushes out the traditional system of governance, but instead, the two work to check and balance each other. For instance, it was suggested, when a new state law is discussed by the legislature, officials should look to the past to see if there was a relevant customary practice the traditional leaders know of. In this way, the council of chiefs would maintain their customary role as caretakers of both the land and the sea and the western system of government would support them.

CHAPTER 6: CANOES & OTHER BOATS

During the time of wars between Palauans, Kayangel sailed back and forth to *Babeldaob*. According to an elder from Kayangel, people from Ngarchelong started sailing the Northern Reefs during the Japanese administration. During the 1950s, when one interviewee from Kayangel was young, he recalls that only people from *Ollei* village and Kayangel sailed canoes, which enabled them to fish the Northern Reefs (Figure 27). This informant remembers people from other villages in Ngarchelong only paddled rafts and canoes. There was not a need for the people of *Despedall* (east coast) or *Mengellang*

to go beyond the reefs in front of their villages because the fish and invertebrates were plentiful at that time. Kayangel and *Ollei* village sailed the Northern Reefs until about 1963, when more people had motor boats. In the 1960s, there were only three men in Kayangel who had diesel engine boats.



Figure 27. Model outrigger sailing canoe displayed at the Palau Pacific Resort. Photo by author.

As previously mentioned, the people of Kayangel were skilled at carving mlai ra bul (southwest style outrigger canoes). In the past, they would trade these small fishing boats with people from *Ollei* and Ngarchelong for corrugated tin canoes. Although the hours of work and skill involved in carving an outrigger canoe were great compared with the crafting of the corrugated tin canoes, trading was fair to the people of Kayangel, who did not have direct access to metal and knew the labor could be reciprocated by asking for a favor of the people from *Ollei* or Ngarchelong in the future. *Ollei* was not the only village to sail outrigger canoes in Ngarchelong after WWII, but they possessed many more outriggers and went further from their dock than people of *Mengellang* village and

the east coast villages did. People from *Ollei* used the southwest island style outrigger sailing canoe to fish all of the Northern reefs, including *Ngkesol* and to travel to Kayangel to collect trochus with the fishermen there (because these boats were small and light).

Ollei village also had the first gasoline powered boat of any village in Ngarchelong in the 1950s. It was a retired U. S. Naval vessel from Peleliu, and was shared among the fishermen of *Ollei*. During the trochus harvest, people from *Mengellang* village poled to *Ollei* on bamboo rafts and joined the people from *Ollei* with their bamboo rafts being towed behind this U. S. Naval vessel (Figure 28). Since they were able to go faster with the assistance of this mother boat, people went out beyond the reefs for two to three days collecting trochus. Before this vessel became non-operational, some people from *Ollei* made their own wooden boats, run by Japanese Yanmar diesel engines. These engines were one cylinder and ran between one and a half to four horse power. These boats were very uncomfortable to ride in as they shook and emitted smoke, according to an informant from Ngarchelong. Now double 200 horsepower engines are common, enabling fishermen to go much farther and feel safe having a second engine if one breaks down. This change in available technology, in addition to ice coolers, has made it possible to catch fish to sell in Koror and beyond. Outboard engines have also enabled fishermen from other parts of Palau to poach the Northern Reefs at night, without



Figure 28. *Mengellang* fisherman poling his bamboo raft.
Photo by author.

getting caught. Some nights, you can see many lights beaming at Ebiil Conservation Area. An interviewee from Kayangel said,

Likely, these fishing, when it's for consumption only, people from *Ollei* stay within the area of *Ollei*. They don't really sail far. People from this village stay here. And then now come transportations like boats, very fast, so they've gone out to the outside the area of *Ollei*, oh no, going further. Here, we also go fishing further. Meaning, there's really no fish, no...there is a difference from long time ago and now.

One of the biggest reasons for the decline in fish populations is the rapid transition from sailing canoes to outboard motors. Ollei and Kayangel continued sailing to fish until as recently as 1963.

CHAPTER 7: FISHING METHODS

Fishermen in the past spent most of their time making and repairing their gear. Compared with working hours of today, one informant from Ngarchelong said that his parents worked long hours to feed their family, almost all day and into the night. Palauan people in the past believed in community service and worked together to get things done. Rewards and payment for work were not a part of Palauan society or cultural values. In the past, a fisherman was considered one of the four or five most skillful in his village if he was able to catch fish using a variety of methods, including: traps, different net-fishing techniques and spearing fish in shallow pools on the reef at low tide (Figure 29).

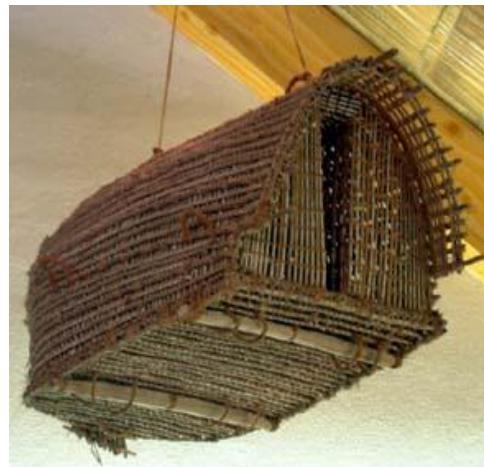


Figure 29. Fish traps were set between rocks. Photo source:
<http://www.pacificworlds.com/palau/sea/fishing.cfm>

When one interviewee was growing up in the 1920s and 1930s, he learned to fish with his father, his uncles and other men from *Dilong* village. Another elder said, “It is a natural thing to do. We grow up and fish with our fathers.” At that time, they fished

once a week when the whole community went out together. Men also went fishing alone, but only when they ran out of fish to eat at home. In those years, men fished using throwing spears, while standing on the reef flat. Now, according many interviewees, the throwing spear would not be effective since there are fewer fish on the reefs and they behave in a wild way. There were no spear guns before the 1950s, but people used traps and many different types of nets in addition to throwing spears.

In the 1950s, three of the elders I spoke with fished together to feed the village of *Dilong* in Kayangel. One elder did not teach his sons to fish because they were in school in Koror and Melekeok and he was living in Kayangel. Another went fishing with his sons when they were young, but now, since his youngest son lives with him in Koror, the son goes fishing with other men from Koror. The son loves fishing for entertainment and goes even when the freezer at home is full, unlike his father did in Kayangel fifty years ago. In the past, people did not share knowledge of how to fish with those outside their family or village. One elder I spoke with said, “I feel that we should no longer keep knowledge and skills within families, but share to everybody else for them to have easier lives.” This interviewee thinks that if there is something you know that is good for human life, you should share it with many people. This major shift is thinking may enable fishing communities, scientists, resource managers and policy makers the ability to collaborate and create more effective MPAs in the future.

Another elder learned to fish in the 1950’s, watching his father use a speargun and then practicing on his own. As he grew older, he could dive deeper and spear larger fish, going out four to five times a week. When his children were ready to learn to fish, he

made their spearguns, bought them masks and fins and showed them how to spearfish. His sons also catch many fish using lines. One fisherman I interviewed learned to fish when he was about 10 years old from his father in the 1960's. He learned to fish with a hand line, then learned to troll and much later learned to use a speargun. Once this man became much stronger, his father taught him to spear fish. This man taught his children and grandchildren to fish and prepare their gear in much the same way. These men live in Kayangel State and go out fishing about once a week, but eat mostly food from the store.

Spearguns have been used since the 1950s, but materials, especially the newer rubber tubing, have become more and more available (Figure 30). In the past, divers would carve their own wooden goggles and glue glass in place. Now, divers at night can see much better with masks and flashlights and dive much deeper with fins. Fishing using scuba equipment is against national law. People in the past made hooks and line from turtle shells and coconut fibers, respectively, for drop line fishing. Many people now use metal hooks, monofilament line and various bright colored plastic lures. With these items available at many stores, more people enjoy trolling and drop line fishing now than in the past. According to one informant, a good fisherman today is someone who can dive and spearfish, catching a good variety of species.

In addition to faster boats, when ice machines and coolers became available, people could fill a cooler with 200 lbs. of fish and keep them from spoiling during the 3 hour boat ride to Koror. Japan provided funding for the ice machine at Ollei Port in 1990



Figure 30. Materials for making spearguns are now widely available.
Photo by author.

and in Kayangel in 1996. People can also store fish in home freezers and only have to restock or go fishing every 2 weeks. With fish finders and GPS, people can target spawning aggregations repeatedly and wipe out local populations.

In the past, the most common method of fishing was to use arc-shaped traps made of bamboo and vines. The sizes of the traps were measured in units called *iltuchel*, from the tip of a man's thumb to the tip of his middle finger, when outstretched. This is about six and a half inches. Depending on the location where the trap would be placed and the

species caught, the traps ranged in size from three to eleven *iltuchel*. The smaller traps would be picked up after a couple of days and the fish removed. The largest traps were hard to lift, so the men had to dive down to collect the fish using spears. After collecting the fish, they would clean the inside of the trap by placing new sand inside. Traps were left for two or three days before they were checked, but not longer because most of the fish would die after that period.

On the east coast of Ngarchelong, the reefs were closer and fishermen often used the smaller traps, sized three to five *iltuchel*. Fishermen from *Ngerbau* village often set their traps at *Tketau* reef. Fishermen from *Ollei* village went trapping most often at *Ochimer*, *Erengoll* and *Rael Masch* reefs using larger canoes, since they traveled farther, and therefore were able to bring larger traps. In *Ollei*, the traps were approximately five to seven feet wide and approximately three and half feet tall. Fishermen who were successful using traps were considered skilled fishermen, because depending on where traps were placed, people caught few or many fish.

Varying locations on the reef attracted different kinds of fish and therefore it was honorable to find the locations that yielded the types of fish that were most valued. Older fishermen found these locations by trial and error, setting a trap and then moving it an inch or two the next time they visited the location. Men would swing the traps from side to side or push them into shallower or deeper water to find the one position where they could catch a desired species or volume of fish. People did not talk about the positioning of their traps to those outside of their family. A man from *Ollei* learned how to adjust the position of the back of the trap without moving the front from his uncle and caught:

klesebuul (lined rabbitfish – *Siganus lineatus*), *tiau* (squaretail coral grouper – *Plectropomus areolatus*), *besechamel* (bigeye emperor – *Monotaxis grandocylus*), *bang* (dash-and-dot goatfish – *Parupeneus barberinus*), *edui* (blue-lined sea breamsnapper – *Syphorichthys spilurus*) and *keremlal* (humpback snapper – *Lutjanus gibbus*). Another style of fish trap, called *bang*, was introduced by the Yapese and made using bamboo and vines set across a channel. A similar trap, called *bub*, was made of mangrove wood. This type of trap was held in place with rocks and the opening facing the shallows. The opening was surrounded with rocks so fish would swim in to hide as the tide went out. These trap was checked everyday and there was a strictly followed rule not to interfere with or steal from another person's trap.

On the east coast, during the third month of the Palauan lunar calendar (January – February, people said “*Dioll a Dekel*,” meaning the bamboo pole is pregnant. During this time, it was believed the fish traps were so full of fish, the fish could hardly move and if left there, the fish would burst out of the trap and escape. The unspoken rule there is that if a fisherman comes upon a full trap during this period, it is acceptable for him to take it out of the water and keep the fish. This may have also been a means of clearing old traps out of the water at the end of a particular fishing season. Since traps and nets in the past were made of natural fibers, they needed to be replaced more often than modern plastic and metal gear. Similar traps made of plastic mesh are less often made and used in Ngarchelung today (Figure 31).



Figure 31. Arc-shaped trap used by fishermen in Ngarchelong. Photo by author.

When men were fishing for a custom and needed to catch many fish, they used a method called *sebu*, in which coconut leaves and vines were woven together to make a *ruul*, a long, floating sweep net that was wrapped around a school of fish to gather them together. The fish were tricked or scared by the *ruul*, but not actually trapped by it at the bottom. Another type of net used to catch schools of fish such as *meyas* (rabbitfish, *Signaus fuscescens*) and *klesebuul* (rabbitfish, *Siganus lineatus*) in the seagrass beds are called *kesokes*. These nets were made of palm leaves with weights at the bottom. The middle of the net was staked to the bottom and the right and left sides of the net were released. When it was time to bring the net in, people from both sides ran and circled the fish, closing the net. These nets were also placed in the water at high tide and then closed

at low tide. When the *kesokes* nets were used outside the reef, fishermen waited for low tide and then collected the fish. *Kesokes* nets were also used with a screen-like trap made of bamboo and vines, called *ngosel* at the tail end to capture the fish. *Usebuu* nets were also traditionally made with palm leaves. *Drek* nets were made with *kerreel* (coconut fiber rope) in the past.

Derau was another method of fishing done with small hand nets where the fish were scooped up. These nets were made to be used by one fishermen who was at times assisted by another man who would use a stick under the rocks to make the fish swim out and into the net. Nets called *ometilab* were made of woven coconut fiber rope in the past and used to catch fish such as mullet. Near the mangrove forest while these fish were sleeping during a high tide, just before morning, men would surround them with these nets. A similar net, called *sab* was used to surround fish that were eating on the rocks. *Berdakl*, small nets, weighted at the bottom, used to wrap around rocks were used in Ngarchelong as well as in Kayangel. Spearfishing was done in the past using a long, thin bamboo pole with a metal fork on top with one or three prongs. Men speared fish at low tide while walking around deeper pools in the coral reef.

After the Japanese Era, nets were woven using twine or nylon, rather than using the traditional palm leaves and coconut fibers. A man from *Ollei* village watched his father and grandfather make nets using a needle in a style taught by a man who was visiting Palau from Saipan. These were throwing nets and had lead weights attached at the bottom. When people went out hunting dugong or fishing for large sharks, they made large nets. Fishermen also made their own spearguns, starting in the 1950s, which were

regarded as very valuable. The model spearguns were introduced to Palau by Indonesian fishermen who drifted to Palau. The spearguns they had with them were made completely of wood rather than wood with iron and rubber tubing as the Palauans have adapted them. Since spearguns were difficult to make and the materials scarce, few people had them in the 1950s. Children were not allowed to touch them because they were intended to last a lifetime. Men drilled the stainless steel and shaped wood from the mangroves. Line fishing was less common in the three to four decades following the War because it was difficult to find the monofilament line and metal hooks introduced by the Japanese. Fishermen took great care of these items.

As with most fisheries, the method for catching *ngasech* (hawksbill turtles - *Eretmochelys imbricata*) changed with Japanese technology and interest in purchasing the shells. In the past, fishermen would only hunt turtles when permitted to do so by the chiefs. When the weather was calm, such as *ongos*, during the easterly winds between February and April, a few men would paddle from *Ollei* village to *Ngkesol* reef. During this time of year the tide is known to be high during the day, so the fishermen would wait for low tide. The men would dive down, look for a turtle, and latch on to it. Before the Japanese interest in turtle shells, Palauans used two hooks to bring the turtles up to the boats. During the Japanese era, they created hooks with long handles and attached fishing line to them. It became a trend to hunt for hawksbill turtles. Men would dive down and hook the turtles around the neck and then release a spear. The hook remained in the neck, while the line rose up to the surface, attached to a piece of driftwood. The

diver would swim back to the boat and the fishermen would retrieve the drift wood and pull up the line.

When young boys in the distant past were learning to fish from their grandfathers, fathers and maternal uncles, it was like trying out for a sport, such as the basketball team, but it was the only sport, so all young boys developed some fishing skills. Today, there are many other activities for young boys to take part in, including going to school, and therefore few of them learn to be skilled fishermen as they did in the past. An elder from Ngarchelong explained that when he was young, in the 1940s, he first learned how to spear fallen palm leaf stems and coconuts and was finally provided with small throwing spears to use in shallow water. Later, he learned to spear fish while diving. He further developed in his fishing skill to use traps. “And from there, my interest grew to include watching the way traps were woven, how to set the traps, and the correct way to lift the trap into the boat,” he explained. Young boys and men developed these skills by going out with and watching their family members who knew when and where to go.

Today, many fathers work in government offices or elsewhere, away from the reefs where their families have fished for generations. Therefore, some techniques from the past are becoming lost because there is no one to teach them. An informant from Ngarchelong said, “the money today is another cause for weakening Palauan traditions and history.” Many men have worked for the government until they were 60 years old and have purchased fish from the market, some having never gone in the water. Elders believe that their great, great grandchildren will not know any fishing methods beyond line fishing, for fun, which is becoming the most popular way to fish.

People in Ngarchelong do not commonly use traps for fishing any more because there are so many poachers they believe their catch would be taken from them. An elder said, “Nowadays, it is difficult because we have become Americanized and have access to fishing tools that have enabled us to do bigger things. That is why there are a lot of things that have become less.” Fish hooks are a good example of the shift in people’s mind frame from before the 1970s. It has become easier and cheaper to purchase hooks and lures, so now, if a hook gets caught in the reef, most people would consider it a waste of time to retrieve it. Instead, most fishermen will snap the line and rig a new hook. People have more money now to spend on new gear and technology such as bright plastic lures, coolers, GPS and fish finders, and therefore do not need to pay close attention to the lunar cycle and tides as people in the past did. Now, regardless of the tide, people can go fishing when they want to due to the accessibility of new gear (Figure 32).



Figure 32. Fisherman loads ice chest, monofilament line and bright plastic lure on outboard engine boat. Photo by author.

CHAPTER 8: TEK

Traditional Ecological Knowledge (TEK) aided in catching fish with less effort. Building on information passed down from one generation to the next, fisherment used trial and error to understand the reproduction and behavior of fish. Generally in Palau, fishermen's knowledge of the movement of fish depending on the phase of the moon helped them decide what species and where they would fish. The phase of the moon also determined to some extent what type of gear fishermen would use. However, according to one interviewee from Kayangel, during full and new moons, the fishing gear, techniques and species targeted were about the same. This man spoke more of differences in the tides affecting types of fishing to a greater extent.

During the new moon, the community of fishermen went out in Kayangel in the 1920s with long nets, called *ruul*. They laid the net out on the beaches at either the north or south end of *Ngcheangel* Islet when it was dark and then waited for the fish to swim in closer with the highest tides. Once the tide went back out, early in the morning, the men would wrap the net around a large variety of reef fish and collect them. One of the elders would say "enough" once plenty of fish were collected and the *ruul* was removed so that at high tide, the remaining fish could swim away. Fishermen in the 1960's would spear *kemedukl* (humphead parrotfish, *Bolbometopon muricatum*) during the new moon because at this time, these fish were known to go to the shallow areas. The new moon is not a good time for bottom fishing using a line in Kayangel due to the extreme tidal change during this phase.

During the full moon in the 1920s, fishermen would light gas lamps and walk out on the reef when the tide was at its lowest to the *chis*, deeper pools on the reef flat where fish get caught. The lamps were used to see the fish hiding under the rocks and the community of fishermen worked together to spear or net them. A fisherman who has been fishing since the 1960s, has learned that the moon determines the spawning and feeding periods for fish. One example of this is *kedesau* (large red snapper, *Lutjanus bohar*), which congregate in a known area of the reef to feed during the full moon. The full moon is the best time for bottom fishing using a line. Also during the full moon, *ngiaoch* (Pacific longnose parrotfish, *Hipposcarus longiceps*) and *mellemau* (Bleeker's parrotfish and bullethead parrotfish, *Scarus bleekeri* and *S. sordidus*) come out from under the coral heads and are visible.

During *mengeai* (first or third quarter moons), people did not go game fishing in groups, but went diving alone for about 10 fish at one time. The tenth day after the new moon and thereafter was the best time for spearfishing. During the night, people used a torch to see the fish and speared them before they moved out of the light. Line fishing was also good during these times of the month in Kayangel, including *mengetakl* (trolling), *mengereel* (bottom fishing) and *omedesakl* (casting). Since the currents are weakest during *mengeai*, especially during the day, fishermen go to the areas where the current is normally strong to spearfish, including outside the reef. Nowadays, when fishermen plan a fishing trip, they also go line fishing during *mengeai* using a large outboard engine boat.

People targeted spawning aggregations around the new and full moons because the fish were fatty then and easy to catch. For example, rabbitfish spawn the 6th day after the new moon in February, March and April. In February, there would be less, but they would be large. In April, there would be many. During the new moon, the tide reaches the lowest levels, so the reef flats were considered easy pickings with a throwing spear. The low tides during the full moon are not quite as low, but were still good times to use the throwing spear on the reef flats. White snapper spawn during the new moon and five subsequent days. Barracuda and Napoleon wrasse also spawn during the new moon. As do game mackerel and silverjaw – all in particular places on the reef.

During the full moon, red snapper go to the shallower areas to spawn and people catch them using lines. In the past, people from the east coast of Ngarchelong went fishing during the full moon at *chelmoll* (barrier reef where waves break), during the low tide, where they would spear the fish trapped in the pools between the corals.

During *mengeai*, spearfishing is good in Ngarchelong because the tide does not go as low and the current is not as fast, so the fish stay in the shallower areas feeding. These times of the month are also the periods of best visibility for diving and people on the east coast of Ngarchelong took advantage of this time to go spearfishing for *mesekuuk* (ring-tailed surgeonfish, *Acanthurus xanthopterus*), especially when the winds are *ongos* (from the east). During *mengeai*, fishermen used to fish for *chum* (blue-spin unicornfish, *Naso unicornis*) in September, when they were aggregating at their spawning grounds. Since the low tides during this part of the lunar cycle do not expose the reefs, these fish are suspended lopsidedly and are therefore easy targets. The fish were gathered in kesokes

nets and speared. Fishermen would collect only as many fish as their household could consume even though there were many, many fish.

In the past, fishermen knew which tides were best for catching a particular species of fish and planned their fishing trips accordingly. Generally, low tide was a better time for fishing, but not the outgoing tide, rather the incoming tide. During the incoming tide, the water is clear and the fish are not moving as much. People used a *berdakl* (a fishing net used to cover a rock), then used an *okakou* (a teaser) or their hands to tease the fish into the net. People in Kayangel also went out to the reef flats during the lowest tides to the *lemau* (small, deep spot within shallow area inside reef), where they would spear stranded fish. During low tide, in the 1950s, a fisherman would see a school of fish and throw rocks at it in order to chase the fish inside the rocks. Then, the fishermen would walk around and use a throwing spear to catch fish such as: *ngiaoch* (Pacific long-nosed parrotfish, *Hipposcarus longiceps*), *mellemau* (Bleeker's parrotfish and bullethead parrotfish, *Scarus bleekeri* and *S. sordidus*), *kemedukl* (humphead parrotfish, *Bolbometopon muricatum*) and *maml* (humphead wrasse, *Cheilinus undulates*) when they are hiding under rocks.

When the tide starts coming in, fishermen use shorter spearguns and target the fish swimming around rather than searching for fish hiding under rocks. One fisherman goes out trolling when the tide is coming in during the morning or evening. When the tide is low, this man catches *mechur* (yellowlip emperor, *Lethrinus xanthochilus*) and *melangmud* (long-nosed emperor fish, *Lethrinus elongatus*). During the incoming or high tide, he goes outside the reef to troll or catch turtles because the water has become clear.

One interviewee recalled fishing in Kayangel with a fishermen from *Ollei* village who knew of an area of the reef in Kayangel where he used a *kesokes* (set net made of coconut fronds twisted around a cord, used to gather fish into a corner where fishermen would spear them) to block the fish from going into the *chis* (depressions in the reef where shallow pools form near shore at low tide), where the fish could hide, but instead corralled the fish into the *cheleu* (deep portions inside the reef with white ocean floor), so it would be easy to get them. Also during an incoming tide, trolling is very good for tuna. Now, due to speed boats, rabbitfish do not stay on the reefs, but swim to deep areas at low tide. In the past, men speared them with one or three pronged throwing spears or used *kesokes* nets or *ruul* in the sea grass beds when the tide was going low.

When the tide is at its lowest, fishermen in Kayangel use spear guns. An elder's son who lives in Koror, currently uses a tide calendar called *Tukidolch*, faithfully looking up the different tide levels and fish to decide when to go fishing. In the past, the fishing community of Kayangel would have spread this information by word of mouth.

The most influential factor governing when and where people went to collect or fish for marine resources was the tides. During a high tide today, many people go out spear fishing or line fishing. In the past, people would set up traps or nets during an outgoing tide and wait for the fish to get caught. Then, they would close the traps.

At low tide, the rabbitfish used to hide in the rocks and pools on the reef flat. During an outgoing tide, rabbitfish and sting rays swam out with small sharks, jacks and clams, crabs, sea cucumbers, shells and urchins. Men would spear fish on the reef flat.

When the tide first started rolling in, the big fish came in along the east coast and men stood on the reef with the throwing spears to catch *mesekeklat* (milkfish – *Chanos chanos*) and *erobk* (giant trevally – *Caranx ignobilis*). During an incoming tide, people also used spears in the past to catch sharks and barracuda. Also during an incoming tide, people used nets to catch mullet and sardines. As the fish came in, fishermen knew that they head straight for large corals to hide under, making diving with a speargun the best way to locate them. The incoming tide was also the period when there was the best visibility for spearfishing.

During stormy weather, in the 1920s, people did not use spears to fish, instead they made small nets, called *berdakl*. These nets were about five feet long by one foot wide, with weights at the bottom, and were used during strong westerly winds on the east side of *Ngcheangel* Islet, as well as in Ngarchelong, to surround a rock, shake the rock back and forth and catch the fish that swam out. During westerly winds in Kayangel, people went to *Iikl* at low tide to catch *komud* (rudderfish, *Kyphosus cinerascens* and *K. vaigiensis*) and *chelas* (convict surgeonfish, *Acanthurus triostegus*). Other types of fishing during this time were not possible in the past because the water was too rough. Fishermen now go to the east side, during a strong westerly wind, where it is calm and dive with a speargun. An elder from Kayangel said, "When the ocean is a little choppy, it is good for getting something which is easy to catch." When it was raining, people said that the *kelat* (bluespot mullet, *Moolgarda sehelis*) have bad vision, and therefore were targeted at these times. The best time to use the throwing net to catch schools of fish from the beach was when the fish could not see you, such as during rain or when it was

sunny with a light wind. There are also those who collect giant clams when the weather is rough. An elder from Kayangel said,

When the wind is coming from the west, we usually eat small types of fish, when we were younger, different kinds of fish. We usually fish using the line outside the reef, fishing red snappers. And when the wind is from the east we fish here getting a lot of different kinds of fish. We also use spear guns, fishing lines and trolling. When the wind is coming from the north or south it is really bad for fishing here because the water becomes grimy.

When it was sunny in Kayangel, people waited to go fishing until the late afternoon and went diving in the lagoon or used spears on the outer reef flats. When it was calm, during a low tide, the throwing spear fishing was best because the fishermen could see the fish. When spear fishing on an incoming tide in the day, it was best on a sunny day so people could see the fish better. When line fishing, it is now best to go on a windy day, so the anchored boat will blow in a predictably straight direction. The wind also keeps the line from being taken away from the targeted depth by the current. In Kayangel, people go line fishing on the opposite side of the atoll from the direction of the wind. When the wind is from the east in Ngarchelong, all types of fishing are good, but fishing is generally not good during *ngebard*, when the winds come from the west.

Just after spawning, fishermen know that the fish act crazy, they are voraciously feeding and are therefore easy to catch. As well as knowing where fish go to spawn, fishermen know where fish go to feed. During a full moon, for example, white snapper go back to deep water in certain areas and can be caught with a line. *Kedesau* (large red snapper, *Lutjanus bohar*) have been known to aggregate to feed in particular areas of the reef during the full moon and are targeted at those times and places. Fishermen know

when and where *tiau* (grouper, *Plectropomus spp.*) aggregate to spawn and target them as well.

As boats go out to catch turtle, the fishermen know where on the reef they like to feed and will tap the bottom of the boat to scare them off the reef. The first one to see the turtle gets to keep it, regardless of who spears it, so the fishermen bang their boats and call out when they get to the feeding grounds, so the first turtle will be theirs, before they even see it. Now, turtles are only caught during the open seasons, which are the opposite of the times of the year people used to hunt turtles in the past, in order to give the endangered species a chance to reproduce successfully. Turtle seasons are closed now during the times when the female turtles are “fatty” and preparing to lay their eggs on the beaches, where they hatched themselves (January - December and June – August).

Fishermen in the past observed fish aggregating to spawn and learned how and where these reproductive cycles occurred. Palauans knew which areas were used by particular species, such as *meyas* (Dusky rabbitfish – *Siganus fuscescens*), a species that spawned in the largest numbers according to an informant from *Ollei*. When the rabbitfish spawn, they gather in the shallow area next to the beach along the east coast on the 6th day after the new moon in April. At this time in their life cycle, just after spawning, the fish act crazy and are easy to catch with a throwing net. When the tide goes out, the eggs are carried to the *chis* (depressions in the reef where shallow pools form near shore at low tide), where they remain until they hatch and grow to about an inch long. At this stage in their development, the fry were known to swim to the *uet* (depression in the seafloor close to mangroves). Knowledge of these migrations helped

fishermen to catch the greatest number fish with the least amount of effort in the past, but may be used in the conservation of these species in the future.

Um (Bluespine unicornfish – *Naso unicornis*) and other reef fish were caught using the *ruul*. Fishermen knew that these fish migrate from southern Babedaob to the north and then around to the eastern side of the island. Once these fish reach the east coast of Ngarchelong, they are known to feed on the tips of algae at low tide. Four to five men would surround the fish slowly with the *ruul* at these times, bringing the fish to the barrier and then they would spear or slap them. In Kayangel, knowledge of the movements of fish was also utilized to catch fish within the lagoon. An interviewee said,

When I was growing up, there was kind of an older male relative who taught us to go fishing the first low tide of the evening. To spear fish near the end of the village, and when it gets later in the evening you follow it towards Ngkesol, because the reef fish here come from here and when it goes on and before dawn you get the fish from the other end, and when it is the tide during the early evening it is over there and continues on like that. It kind of goes in a circle.

An interviewee from Ngarchelong did not learn the details from his grandfather, but recalls admiring his knowledge of which species of fish came in first with an incoming tide, and which species was coming next. This skilled fisherman did not set his trap right when the tide switched to incoming, but waited until the appropriate time when his targeted species started to come in at the edge of the barrier reef. This same sort of knowledge was used during an outgoing tide at the breakers on the barrier reef. The fishermen called it *mengiil* (waiting for the tide to turn and begin to go out). People waited for the species of fish of their choice to begin migrating through a channel and

then spread their nets. Since the Japanese people started bringing in goggles and metal spears, this type of knowledge of specific species' migrations was no longer needed and its use started fading out in the 1920s.

Two types of trees were mentioned in many interviews as a way of knowing when to harvest particular species. During March and April, the tropical almond tree leaves turn yellow, then red, signaling that the time is right to hunt green sea turtle and a large mudflat crustacean that lives near the mangroves of Ngarchelong (Figure 33). People say



Figure 33. The tropical almond tree. Photo by author.

that these animals are “fatty” at this time, meaning that they are gravid or with eggs. People knew sea urchins were “fatty” when the breadfruit tree flowered and fruited around February (Figure 34). In one conversation with an elder from Kayangel, the *bachiei* (Pandanus flowering) season was mentioned as a signal for a certain type of fishing, but the man could not remember which species. Since fishing techniques today

are so different from those of the past, these seasonal changes in plants are no longer discussed when planning what to harvest, and are therefore not well known by younger Palauans. However, in the 1950s and 1960s, one fisherman's father taught him to watch the senescence of the trees and he has passed this valuable information on to his children in Kayangel so it will not be forgotten.



Figure 34. The breadfruit tree. Photo by author.

CHAPTER 9: SALE AND CONSUMPTION

Interviewees from Kayangel have mixed opinions regarding the sale of their marine resources. Approximately half of the elders expressed a need to sell reef fish caught outside of the lagoon and other restricted areas in Kayangel State. For some families, this is their main source of income and therefore a necessity from their point of view in order to pay electricity and phone bills and other expenses. Many other elders

expressed concern over the limited resources being available to feed everyone in the future if they are not conserved today.

There was a State clam farm in Kayangel's lagoon a few years ago, populated by clams collected at *Ngkesol* reef. This mariculture project failed because people kept stealing the clams. Fishermen now keep their clams under their buoys, close to shore, where their boats are moored (Figure 35). This way, each owner can keep an eye on their clams, waiting to harvest them during a period of rough weather, when fishing is not safe.



Figure 35. Boat moorings in *Dimes* village. Photo by author.

In the 1950's a man went to the dock in *Ngerbau* village with his grandparents to wait for the fishermen to return. The boy gave the fishermen fifty cents and in time, he paid a dollar in exchange for enough fish to last for a week or two. During the 1980's many fishermen from Ollei sold fresh reef fish to buyers in Guam and Saipan, on ice, in

coolers. The Ngarangeseu co-op had a booming business, selling large amounts of fish in Palau and internationally, between 1986 and 1992. A commercial fishermen from Ollei started noticing a decline in fish populations in 1992. He said, “When Bob [Johannes] came over and talked to me about putting in place some laws and set aside some areas for conservation, it was a total conflict of what I was doing at the time, because I’m an exploiter of the reefs.” Selling reef fish directly to buyers in Guam and Saipan is now against the law and many of the fishermen who were involved have found other ways to earn a living. It became difficult to catch and sell enough fish to offset fuel costs with declining fish populations due to over-harvesting (Figure 36). Now, many people who earn a living by selling their catch fish by trolling and also spearfishing.



Figure 36: Gasoline prices in Palau, February 2007. Photo by author.

One of the elders I spoke with currently eats fish about twice a week because he enjoys it. He said, “It’s in our Palauan blood to eat fish.” Since he lives in Koror now to be near to the hospital, fish is not available everyday, as it is in Kayangel. When he cannot eat fish, he eats canned goods or chicken, which he says are very bad. According to this interviewee, there are fish for sale in Koror, but these are more expensive than imported meats, such as canned goods or chicken. This elder does not believe it is sustainable to sell local reef fish in markets in Palau, but people do it because they are desperate for money. He said that it is also beneficial to Palauans in Koror when Kayangel fishermen sell their catch because fish is the healthiest protein to consume. One elder purchases fish from Kayangel in Koror, where he lives, and sends it to his children in Guam. However, he claims that this is very expensive.

Many of the elders who live in Kayangel do not believe Kayangel’s fish should be sold in Koror or internationally. One elder believes that if you live in *Dimes* village, “the home of Ucheliou, you should not be concerned with ways to become rich, but instead enjoy happiness, rest and relaxation. The only way is to conserve our food, and not sell them because if we run out, there is no more so it will be difficult for us to get food.” Another elder who lives in Kayangel eats fish everyday, three meals a day. His family also shops at Surrangel’s in Koror for chicken, which they eat once a week. There is always fish at his house since he fishes and has an icebox to store fish in. Another man who fishes and lives in Kayangel also eats fish at almost every meal because it is free, and at the same time “fresh and fatty.” His family only eats canned mackerel when he is busy and does not have time to fish. This man does not believe Kayangel’s fish should

be sold in Koror because he said, "Kayangel food is not for sale." This elder believes that if the fish are sold, people will become comfortable having lots of money without realizing that there will not be enough for the villagers in the future who live far away from the stores in Koror.

In Kayangel's lagoon and within 500 meters of the surrounding shallow reefs, there is a state law limiting fishing to subsistence and customs use only. In the past, it was taboo to bring food outside of Kayangel because the island was so remote before double outboard motors. A State funded boat now goes back and forth between Kayangel and Koror on Fridays and Sundays of payday weekends, every two weeks. This boat stops at *Ollei* port of Ngarchelong in both directions. Now, people from Kayangel are able to sell fish from *Ngkesol* reef at markets in Koror. At this time, most fishermen from Kayangel and Ngarchelong sell their fish in Koror at Palau Modekngei Cooperation Incorporated (PMCI) (Figure 37), Happy Fish Market (Figure 38) and The Blue House (Figure 39).



Figure 37. The Palau Modekngei Corporation Incorporated sells fresh fish and produce. Photo by author.



Figure 38. Reef fish sold in Koror. Photo by author.



Figure 39. The Blue House Market is located in downtown Koror. Photo by author.

From Ngarchelong, a market van travels to Koror to sell fish, invertebrates and produce in markets on Mondays and Thursdays of non-payday weeks. During payday weeks, this van travels between Ngarchelong and Koror on Mondays, Wednesdays, Thursdays and Fridays. Marine invertebrates for sale include: *oruer* (giant clam, *Tridacna crocea*), *chesechol* (beach clam, *Atactodea spp.*) (Figure 40) and *cheremrum* (small black sea cucumbers, *Actinopyga miliaris* and *A. echinifera*) (Figure 41). Since the compact road, circumnavigating Palau's main island, has been completed, it takes approximately forty-five minutes to drive from Ngarchelong to Koror, one direction. This relatively short commute has made the markets much more accessible to communities in both Kayangel and Ngarchelong States, enabling people to sell more seafood in Koror. At present, it appears that as long as there is a market in Koror for fish and invertebrates from Kayangel and Ngarchelong, people will continue to sell them to earn money. There are no taxes benefiting Kayangel or Ngarchelong State governments from the sale of these fish or invertebrates. In order to create such a tax, to be used for enforcement of poachers for example, it would take an act of the national government's legislators.

During the period of my field research in 2007, there was a privately owned live grouper boat fishing *Ngkesol* and *Ngerael* reefs and selling their catch to Taiwan and Hong Kong. A 1 ft. long live grouper sold for \$125. Pacific Live Fish Company, in contract with Kayangel State, was looking for more international buyers in the live reef fish trade to purchase white and red snappers, such as *mechur* (*Lethrinus xanthochilus*)



Figure 40. Small white beach clams sold in Koror. Photo by author.



Figure 41. Chopped sea cucumbers sold in Koror. Photo by author.

and *keremlal* (*Lutjanus gibbus*), respectively. These fish were also sold to the Kayangel State government for special occasions, such as the approximately one hundred pounds I observed being purchased for the Ngarangeseu New Year's celebration in February 2007. The Palauan owner from Ngaremlengui State was the captain of this boat, working with a

Palauan from Kayangel as second captain and a crew of five fishermen. Two of these fishermen were Chinese and three are Filipino nationals. These men lived on this boat, stopping at *Ngcheangel* Islet every few days to unload their catch in floating net holding pens within the lagoon and to pick up produce for their own consumption (Figure 42).



Figure 42. Four live grouper holding pens within Kayangel's lagoon.
Photo by author.

In addition to catching tons of live grouper and other reef fish, the Pacific Live Fish Company caught large amounts of smaller feeder fish which they used to grow the valuable reef fish to a larger size in the holding pens in the Kayangel lagoon. Unfortunately, Kayangel was receiving a very small amount of money in exchange for permission to vastly over-fish their state reefs in a highly unsustainable manner. During the course of one year, the Pacific Live Fish Company sold 20 tons of reef fish and paid Kayangel State a mere U.S.15,000 (Haruo, 2008).

In addition to fishing *Ngkesol* reef, this private company spent a great deal of time fishing *Ngerael* Reef of Ngarchelong State. The traditional chiefs of Ngarchelong instituted a moratorium on December 5, 2007, banning all non-Palauans from fishing in their state waters. Incidentally, this became a Ngarchelong State law February 11, 2000. Since the commercial fishing did not stop, the Pacific Live Fish Company's boats and gear were confiscated by the traditional leaders on March 4, 2008 and the company's owner was fined \$10,000 (Figure 43).



Figure 43. Pacific Live Fish Company's mother boat and two "banana boats" moored in Kayangel lagoon. Photo by author.

An elder from Ngarchelong does not believe it is wise to sell fish in Koror. He said,

Say that this old man, with his knowledge going back to when he was 10 or more years old and spanning approximately 60 years, say that at that time there was no selling. Why sell now that the fish are practically gone? Tell her no, we should wish to conserve for our own people.

This man indicated that he would like to discuss the sale of reef fish further among a group of fellow *rubaks* (respected male elders) from Ngarchelong. Unfortunately, it was not possible to organize group interviews during the period of time I conducted my research, but it is recommended for future studies of both Kayangel and Ngarchelong. In expressing views on sensitive issues such as the sale of reef fish, it is customarily acceptable for traditional leaders to express their own opinions in the company of other chiefs who can deliberate together, especially in the company of an outside researcher.

CHAPTER 10: FUTURE DEVELOPMENT

There are currently two community development projects underway in Kayangel. A two-lane road project, which has been planned since the 1980s, will circumnavigate the perimeter of *Ngcheangel* Islet in dredged coral. Coral rocks line presently either side of the road and fine sand mixed with rubble will cover the road's surface when it is finished (Figure 44). This material was dredged from *Ulach* channel, on the west side of the atoll, to enable larger boats to enter the lagoon and access the dock, carrying the subcontractor's (Surangel Construction Company) earth-moving equipment. Road material was also dredged from the area where the new dock was built to accommodate the large barges and other vessels carrying construction materials for the electricity plant, the new water system and the road project. The road project began in September 2006, clearing the forest approximately six meters from the beach and smoothing the ground

where a walking path was before. The new road will provide for economic growth through increased tourism



Figure 44. Kayangel's perimeter road. Photo by author.

and will also enable local residents better access to their land for building homes and visitor bungalows and working in taro patches and gardens. Every interviewee who spoke about this road project expressed positive opinions and information.

The other project currently underway in Kayangel is a well drilled to the shallow aquifer in *Dilong* village. Pipes have been laid from it and will be extended to each building on *Ngcheangel* Islet (Figure 45). Currently, people collect water via rooftop rainwater catchment systems. Both the new plumbing project and the perimeter road project have been funded by the Government of Taiwan and will be operated by the Palau

Utilities Corporation (PUC). Additionally, many people in Kayangel are interested in building a wastewater treatment facility. Currently, houses have septic tanks and some elders believe this is the most sustainable way to dispose of waste on an atoll with no natural wetlands.



Figure 45. Water pipe laid next to road in *Dimes* village. Photo by author.

In *Dilong* village, there is a diesel power plant, which was built in 2002. The fuel is imported from Indonesia, generating twenty-four hour electricity to homes that previously only had twelve hours of electricity, from 6:00 p.m. – 6:00 a.m. Street lights have been installed along the main roads in the villages. To complete this project, six small trucks were brought by boat from Koror and have since been purchased by local

families (Figure 46). There are also many more motor bikes and bicycles in Kayangel than I observed while visiting in 2002.

There is a law in Kayangel that no building be built over two stories high. However, some elders do not want to see any buildings built over one story high. Many



Figure 46. Truck brought to Kayangel to construct recent water, electricity and road projects. Photo by author.

elders would like to see very little development in the future, but agree that it would be good for each household in Kayangel to build 1-3 bungalows that they maintain for rent to visitors. This way, the people of Kayangel will have equal opportunities to make money. Some families have bungalow projects underway (Figure 47). In *Dilong* village, some interviewees expressed concern over natural and cultural areas that may be destroyed if Sandra Pierantozzi and Shallum Etpison (prominent and powerful Palauans

who live in Koror and are not citizens of Kayangel State) develop the properties that they purchased, separately, according to their respective development proposals. An interviewee said, "If they have feelings to protect those areas, they could come. If not, we have to respect the hopes of the villagers that we need to protect those areas." This man also expressed concern over tourists not caring about natural or cultural sites, such as the sacred hibiscus tree, located in the southeast part of *Ngcheangel* Islet, unless they are informed of their importance.



Figure 47. Bungalow in *Dilong* village with water catchment tank.
Photo by author.

An elder from *Dilong* would like to see an expanded clam farm in the lagoon in the future. Many interviewees said that they thought *Ngcheangel* Reserve is working to protect valuable fish stocks and expressed a desire to create more MPAs at *Ngkesol*, *Ngerael* and *Ngebard* reefs. In discussing the formation of *Ngeruangel* Reserve (enacted in 1996), an interviewee said,

In the past I didn't see any importance, but now looking at it, newly created conservation areas are protecting it so there is a significant chance in the reef. Due to the law protecting the reef, fish are flourishing in the reefs, which leads me to think if we could increase the conservation area.

Many elders from Kayangel described their ideas to enact varying systems of MPAs in the future, in which *Ngkesol*, *Ngerael*, and *Ngebaard* reefs be closed and opened on a rotating schedule of five years at a time to allow marine resources a chance to replenish the reefs.

A elder from *Dimes* would not like to see any development in his village, but likes it the way it is. Since the Kayangel State boat comes from Koror twice every other weekend, many plastic, metal and other imported materials are brought to *Ngcheangel* Islet. These materials are later discarded in pits, approximately four meters in diameter, scattered around the edges of the new perimeter road (Figure 48). There are about ten of these unofficial disposal sites located around the perimeter of *Ngcheangel* Islet. One interviewee said, "When we walk on the island, it is very unclean, you see plastics and cans." He proposed lining the sides of the new road with concrete and plumeria trees and to designate trash disposal bins. The elementary school students have made and distributed recycling bins, but many people do not use them properly, according to one informant (Figure 49). As these non-biodegradable materials slowly break down, they may leach into the aquifer. It is suggested that plastics, metals and toxic materials be sent back to Koror on the State boat, when cargo space permits, and then to a large recycling center outside of Palau in the future to keep pollution out of marine and fresh water ecosystems.



Figure 48. Trash piles contain items that cannot be burned. Photo by author.



Figure 49. Recycling bin made by Kayangel Elementary students.
Photo by author.

People from Ngarchelong who work in Koror do not plan to move back to their villages and commute to school and work in Koror now that the Compact Road Project has been completed. At this time, relocating would be too expensive for most people since they would need to buy the additional gasoline to drive about 45 miles in each direction, pay for the construction of new homes in Ngarchelong and continue to pay utility bills and buy groceries. Since schools, businesses and many government offices are located in Koror, moving back to Ngarchelong does not make economic sense for the families of interviewees. Many informants said that family members might return to build homes on family land in Ngarchelong when they retire.

A few interviewees want to see the State government build a water system so that each family has access to running water for farming. One elder stated,

People of my generation believe that there are very few things that we lack, we needed a good road to connect our villages and we have that now (Figure 44). Now my dream is to see a piped water system for Ngarchelong and Ollei. I heard that the state would supplied water by sources in Ngaraard but that is still not confirmed. I am currently getting all my water from rain water in my tanks. If the piped water system is completed then my dreams will be realized.

Another believes Ngarchelong's leaders should look into what the land can produce, such as fruit trees, so they do not duplicate what other states are growing and selling. In addition to farming the land, this elder suggests the state enact terrestrial Conservation Areas to protect any areas with endemic trees and to function as bird refuges. This interviewee believes that since Ngarchelong has more ocean area than land, the state government should also enact another MPA to protect the spawning area for the sea cucumber locally known as *sachesachera* and start farming these invertebrates, creating a

viable industry for local consumption. An interviewee from Ollei would like the State government to subsidize fishing and assist people with the development of fishing cooperations to improve fishing techniques and help fishermen locate buyers.

Elders do not want to see grocery stores or restaurants built in their communities in Ngarchelong. An interviewee said, "I think I want to see it undeveloped for a long, long, long time." The only developments most interviewees want to see are small bungalows built for tourists to stay in, similar to those in Kayangel and Ngaraard States. Others mentioned that each family should build an extra room on their homes for visitors to rent while they are staying so tourism income will go directly to the people in his village. Additionally, by developing home-stay bedrooms and bungalows rather than hotels, visitors will spend time with locals and learn more about Palau's unique culture without turning villages into the type of resorts that already exist all over the world. While visitors are staying, elders believe they should buy locally prepared food from the families they are staying with. Interviewees discussed a possible rotating schedule so that each family takes turns hosting tourists in their homes or bungalows.

One interviewee believes that by preserving the cultural and natural aspects of his village, they will benefit in the long run by offering tourists something they cannot experience anywhere else. He believes that developing a large hotel would bring many problems, including many foreign workers, who will work for much less pay than Palauans and will create an added strain on public services such as water and sewage. These people will not spend their earnings in Palau, but send their wages abroad to their families. Interviewees are concerned that if large hotels are developed in their villages,

the aspects which have existed there for a long, long time may be destroyed and cannot be replaced. Only one of the interviewees mentioned the benefits of a new hotel being constructed in Ngarchelong in the future. This elder supported the idea to provide jobs to local citizens. He said,

With regards to the sea, we can have industry but if we don't have good monitoring and enforcement, then it cannot be sustained. There are clam farms but there was no monitoring and enforcement, so there was poaching on those farms. Even the Conservation Areas of Ngarchelong are suffering because there is no monitoring and enforcement of the conservation laws. Because some people don't adhere to the conservation laws the rest of us suffer. Unless there are employment opportunities for all, none of these things can come to fruition. Because people don't break these conservation laws because they want to they do so because they are desperate.

Many people from Ngarchelong are looking towards high-end, low volume tourism such as scuba diving, snorkeling, kayaking and catch and release sports fishing to minimize impacts of tourism on the health of their reefs, while improving the income of local families. An interviewee said, "I also think about having...water activities and sports in place locally so that every boat coming here will terminate here in this very port for the local boys and boats to go out there and get some money from people who visit us." There is a possibility that parts of Ebiil Conservation Area, where there is currently no fine in place for poaching, could be used for such purposes. During monthly grouper spawning monitoring trips at Ebiil Conservation Area in February and March, the Palau Conservation Society found the same people illegally entering Ebiil and taking tourists fishing (Figure 50). If there were a few tour boats operating out of *Ollei* port each day, these poachers would not have a chance to enter the MPA.



Figure 50. Poachers illegally fishing Ebiil Conservation Area. Photo by author.

CHAPTER 11: SUMMARY/CONCLUSIONS

Palau's greatest conservation practices in the past were imbedded in a culture in which people respected their elders and the greater good of the village before themselves. This culture is known in the older generation of seniors, who remember the way Palau was before WWII and the American Administration. These elders have taught the emerging generation of youth to be conservative and consider the future before the present in managing the health of Palau's marine resources in the face of a globalized economy. Many people of Kayangel and Ngarchelong States realize that their unique culture and spectacular coral reefs are the future wealth of their communities.

Customary Marine Tenure (CMT) systems were the single most effective way villages of both Kayangel and Ngarchelong managed their marine resources in the past. Due to respect for elders and a desire to maintain positive family status in the village,

people did not poach other village's reefs nor over-harvest their own to the point of fish and invertebrate population declines. Additionally, resources were indirectly conserved in the past due to people's beliefs in gods or ancestors taking the form of marine animals, which were taboo, and a need to consider safety from unfriendly neighbors and natural dangers.

In the communities of Kayangel and Ngarchelong states today, reef tenure is held at the state rather than at the village level and poaching of the Northern Reefs by outsiders is a serious problem. The state governments of both Kayangel and Ngarchelong are not fully enforcing their own laws established to protect their marine resources. This is especially true in Ngarchelong, where reefs are more accessible, both due to the compact road and via boat, to people living in Koror. In Ngarchelong there are no deputized officers currently employed due to state budget shortfalls and a lack of desire to inform on friends and family violating marine laws. Enforcement of existing laws could become a high priority of both Kayangel and Ngarchelong states in the future, reflected in higher salaries and an increased number of positions for deputized conservation officers/marine police. Once these positions are allocated sufficient pay, the status of deputized officers within the communities will increase. As a result, others in the community will be more likely to respect the jobs of the people holding them and will be less likely to break the laws. Funding for this increase in state spending for enforcement could come directly from fees collected from violators and revenues generated by the tourism industry.

Elders in these communities have lost a great deal of their customary authority to practice traditional resource conservation over the past three decades, since state governments came to be in 1981. The generation of elected leaders currently in power have often been swayed in recent decades by opportunities for short-term economic growth and have not listened to the ideas of traditional leaders. However, there is a revitalization of traditional leadership, as recently evidenced in the confiscation of gear and the fine imposed on the Pacific Live Fish Company by Ngarchelong's council of chiefs.

In the last ten years, the internet, cable television, cellular telephones and paved roads have opened up the communication and information transfer to Kayangel's and Ngarchelong's villages. Today's youth are both influenced by the consumerism of global marketing and the ability to see how special and valuable their elders and healthy reefs are to the future wealth of their villages. More and more, young Palauans appear to be returning to Palau after studying marine ecology, environmental conservation and law and are prepared to combine the wisdom of their culture with the technology and science of the world for best resource management practices. Traditional Ecological Knowledge (TEK) still held by elders can be evaluated with the modern tools Palau's youth possess in the formation of new Marine Protected Areas (MPAs).

Not surprisingly, much TEK has been forgotten over the past four generations in the villages of Kayangel and Ngarchelong States. With masks, snorkels, fins, outboard engines, ice coolers, GPS and fish finders, information about the behavior of fish and invertebrates within the marine ecosystems of the Northern Reefs is no longer necessary

to a lucrative harvest. Although some young people do live, fish and collect in the same places where their families have for many generations, most children move at least as far away from their villages as Koror by the time they are fourteen years old to attend high school. Since TEK is location dependent, fishing with adults in another place does not forge the same level of connection to or understanding of resources as learning marine ecology based on generations of observations in one place does. Generally speaking, the older a person is, the more TEK they have accumulated. Possession of TEK does not appear to vary depending on education levels or religious beliefs, but instead on time spent fishing and collecting with older community members. Unexpectedly, elders are now willing to share TEK with Palauans outside of their families for the benefit preserving this information and making others' lives easier.

Great efforts have been made to record this information before it is lost, a pursuit elders believe should continue. Organizing students to interview their own families through the Ministry of Education may be the best way to retain TEK. High School students could have a mandatory semester spent in their family village, recording conversations with their grandparents and keeping a journal in order to write a final term paper. With TEK recorded for each village, MPAs in the future can target conservation of key areas within mangrove, seagrass and coral reef systems. Palau has seen enormous success in recent years with conservation education campaigns such as, "*A Uel a Sechelid*" (Turtles are Our Friends), in the schools. Because of this and other programs, many children now refuse to consume endangered species such as green turtles and express great concern to their parents when they litter.

Elders in Kayangel and Ngarchelong, as a whole, are passionate about maintaining CMT systems and reestablishing the authority of traditional leadership in their villages. Kayangel's and Ngarchelong's state governments could be reorganized in the near future as turnover occurs in the offices of elected officials so that these Western-style governments serve to support the traditional leaders. If both state legislatures, for example, were led by the chiefs, rather than advised by them, customary reef management practices which have been successful could become state laws. While it is certain that these communities will never return to their past way of life in the modern world, most people agree that they need to become self-sufficient once again through dependency on healthy reefs and the tourism dollar. Sale of reef fish outside Palau is simply not sustainable. An elder from Ngarchelong said this best by exclaiming that if people want to eat Palauan reef fish, they should pay to visit Palau.

For the economic and environmental sustainability of Kayangel and Ngarchelong to be successful, elders believe communities must focus their attention on educating each new generation on the culture and ecology of their villages. These two elements will attract visitors from around the planet. For this shift in the education system to be successful, state government officials need to work to support customary leaders and reinstate high respect for elders. Armed with technology, science and most importantly, the TEK which has been the wealth of Palauan families for generations, Palauans can make truly informed decisions on where to enact and how to manage new MPAs. The revenues generated through low volume, high-end ecotourism surrounding these MPAs will enable their monitoring and enforcement to be sustainable into the future.

REFERENCES CITED

- Adams, T. (1998). The interface between traditional and modern methods of fishery management in the Pacific islands. Ocean and Coastal Management, 40, 127-42.
- Alkire, W. H. (1972). An introduction to the peoples and cultures of Micronesia. An Addison-Wesley Module in Anthropology, no. 18. Menlo Park, CA: Cummings Publishing Company, 1972.
- Aswani, S., & Hamilton, R.J. (2004). Integrating indigenous ecological knowledge and customary sea tenure with marine and social science for conservation of bumphead parrotfish (*Bolbometopon muricatum*) in the Roviana Lagoon, Solomon Islands. Environmental Conservation, 31, 69-83.
- Aswani, S. (2005). Customary sea tenure in Oceania as a case of rights-based fishery management: Does it work? Reviews in Fish Biology and Fisheries, 15, 285-307.
- Barnett, H. G. (1942). Invention and culture change. American Anthropologist, 44, 14-30.
- Barnett, H.G. (1960). Being a Palauan. New York: Henry Holt and Company, Inc.
- Berkes, F., Colding J., & Folke C. (2000). Rediscovery of traditional ecological knowledge as adaptive management. Ecological Applications, 10, 1251-1262.
- Berkes, F., & Seixas C. S. (2005). Building resilience in lagoon social-ecological systems: A local-level perspective. Ecosystems, 8, 967-974.
- Childress, D. H. (1988). Ancient Micronesia and the lost city of Nan Madol: including Palau, Kosrae, Yap, Chuuk, Pohnpei and Guam. Kempton, IL: Adventures Unlimited Press.
- Cinner, Joshua. (2005). Socioeconomic factors influencing customary marine tenure in the Indo-Pacific. Ecology and Society, 10, 36-50.
- Cordell, J. (1993). Turning the tide: Conference on indigenous peoples and sea rights, July 14-16, 1993, selected papers. Darwin: Northern Territory University.
- Division of Marine Resources of the Republic of Palau. (June 1998). Palau domestic fishing laws. [Brochure]. Government of France: Information Section of the Marine Resources Division of the Secretariat of the Pacific Community.

- Drew, J. (2005). Use of traditional ecological knowledge in marine conservation. Conservation Biology, 19, 285-293.
- Force, R. W. (1960). Cultural change in Palau. Fieldiana: Anthropology, vol. 50. Chicago: Chicago Natural History Museum, 1960.
- Gelchich, S. (2006). Co-management policy can reduce resilience in traditionally managed marine ecosystems. Ecosystems, 9, 951-966.
- Golbuu, Yimnang. Pers. Comm. March 2006.
- Graham, T. & Idechong, N. (1998). Reconciling customary and constitutional law managing marine resources in Palau, Micronesia. Ocean and Coastal Management, 40, 143-64.
- Haruo, P.H. (2008, March 12). NSA contemplates pressing charges vs. Ongidobel. Palau Horizon. http://www.mvariety.com/?module=displaystory&story_id=8101&format=html. Downloaded on March 12, 2008.
- Holm, Tiare. Pers. Comm. October 2006.
- Holyoak, L. T. (2001). Ethnography and historic preservation – Palauan challenges. Cultural Resource Management, 24, 36-38.
- Holyoak, L. T., Gibbons, F., Miko, F., Besebes, M., & Knecht, R. (2005a). Ethnographic and Oral History Survey of Kayangel State, Republic of Palau. (Palau Bureau of Arts and Culture and Historic Preservation Office). Republic of Palau: Ministry of Community and Regional Affairs.
- Holyoak, L. T., Gibbons, F., Miko, F., Besebes, M., & Knecht, R. (2005b). Ethnographic and Oral History Survey of Ngarchelong State, Republic of Palau. (Palau Bureau of Arts and Culture and Historic Preservation Office). Republic of Palau: Ministry of Community and Regional Affairs.
- Hviding, E. (1998). Contextual flexibility: Present status and future of customary marine tenure in Solomon Islands. Ocean and Coastal Management, 40, 253-69.
- Jentoft, S. (2000). The community: A missing link of fisheries management. Marine Policy, 24, 53-9.
- Johannes, R.E. (1981). Words of the lagoon: Fishing and marine lore in the Palau

- District of Micronesia. Berkeley: University of California Press.
- Johannes, R.E. (Ed.). (1989). Traditional ecological knowledge: A collection of essays. IUCN, The World Conservation Union.
- Johannes, R.E. (2002). The Renaissance of community-based marine resource management in Oceania. Annual Review of Ecological Systems, 33, 7-40.
- Kazuo, Kobayashi. (2004). Origin of the Palau and Yap trench-arc systems. Geophysical Journal International, 157, 1303–1315.
- Kobayashi, K. (2004). Origin of the Palau and Yap trench-arc systems. Geophysical Journal International, 157, 1303–1315.
- Klee, G. A. (1972). The cyclic realities of man and nature in a Palauan village. (Doctoral dissertation, University of Oregon).
- Klee, G. A. (1980). World systems of traditional resource management. New York: V.H. Winston and Sons.
- Kitalong, A. H. (2002). A personal tour of Palau. Koror, Palau: Author.
- Le Compte, M., & Schensul J. (1999). Designing and conducting ethnographic research. Walnut Creek, CA: AltaMira Press.
- Machiko, Aoyagi. (2002). Modekngei: A New Religion in Belau, Micronesia. Tokyo: Shinsensha Press.
- Moller, H., Berkes, F., Lyver, P. O., & Kislalioglu, M. (2004). Combining science and traditional ecological knowledge: monitoring copulations for co-management. Ecology and Society, 9, 2.
- Office of Planning and Statistics, Republic of Palau. (2000). Census of population and housing of the Republic of Palau. Koror, Palau: Author.
- Ostrom, E. (1990). Governing the commons: The evolution of institutions for collective action. Cambridge: Cambridge University Press.
- Pacific Worlds & Associates. (2004). Fishing. In The Sea. <http://www.pacificworlds.com/palau/sea/fishing.cfm>. Downloaded on 12 March 2008.
- Perryclear, W. (2002). In Kitalong, A.H. A personal tour of Palau. Koror, Palau:

Author.

- Ruddle, K., Hvding, E., & Johannes, R.E. (1992). Marine resources management in the context of customary tenure. Marine Resource Economics, 7, 249-273.
- Silvano, R.A.M., & Begossi A. (2005). Local knowledge on a cosmopolitan fish: Ethnoecology of Pomatomus saltatrix (Pomatomidae) in Brazil and Australia. Fisheries Research, 71, 43-59.
- U.S. Army Intelligence Division, Office of the Engineer Headquarters & USGS. (1956). Military geology of Palau Islands, Caroline Islands. U. S. Army Forces Far East and 8th U.S. Army (rear).
- Virdin, J. W. (2000). An institutional model for co-management of coastal resources in Fiji. Coastal Management, 28, 325-335.
- Wiber, M., Berkes F., Charles, A., & Kearney, J. (2004). Participatory research supporting community-based fishery management. Marine Policy, 28, 459-68.

Appendix 1

List of Informants

Kayangel

1. Redechor Mutsuwo Delkuu (Ngerdimes hamlet)
 2. Buik Redechor Chokai Kloulubak (Ngerdimes hamlet)
 3. Obakrusong Sngebard Lluul (Ngerdilong hamlet)
 4. Ulengchong Tony Iechad (Ngerdilong hamlet)
- Johnson Bandarii
 Obak ra Kelau Ngiraked Bandarii
 Ungilreng Hance
 Mekar Hosei
 Billy Graham Kemesong
 Brenges Kemesong
 Ngiraitaoch Ngiraked
 Remechesengel Dave Ngirakesau
 Remoket Markub
 Tomas Obak
 Delmel Ruluked
 Tadao Ruluked
 Inawo Sebak

Ngarchelong

1. Uong Victor Joseph
 2. Ngiraureked Siliang Tem, Ngebei hamlet
 3. Tet Sing Ichi Sato, Ollei hamlet
- Iyechadrarikl Renguul Kloulchad
 Sanders Kloulchad
 Pkoi Maldengesang
 Ngetiungel Ngiratereked
 Rita Olsudong
 Faustina Rehuher
 Bedul Sato Remoket
 Dirraimei Ocherur Renguul
 Jelina Renguul
 Baudista Sato
 Orakidil Biep Sato
 Dirrakelau Shiro
 Rteruich Katsushi Skang
 Adelbairakeong Ngirchemat Trolii
 Subediang Ubedei

Appendix 2

Interview Instrument 1:

Introduction and Oral Consent Script: Hello, my name is Robin Putney. I am a graduate student at San Jose State University and volunteer with the Palau Conservation Society (PCS). I worked at the Coral Reef Center as a Peace Corps volunteer from 2000 – 2002, as an Education Officer with Sherry Ngirmeriil. I would like to interview you as part of my thesis research towards a Master's of Science degree.

This study is aimed at better understanding historical marine resource management systems used by fishing communities of the Northern Reefs of Palau. Information collected for this study may be used to assist the people of Kayangel and Ngarchelong States to improve the management of the Northern Reefs. This information will be stored at the Ngarchelong and Kayangel State offices as well as at PCS, PCC and the Palau National Archive for future generations of Palauans to learn about their families' history and customs. You have been identified as an expert on this subject and I would like to ask you some questions about your village's use and management of areas in the Northern Reefs. These questions may take 1-2 hours to answer.

You should know that your participation in this study is voluntary and choosing not to participate in any part of this study will not affect your relations with PCS or any other organization in Palau or the United States. There are no risks or benefits associated with participating in this study. The results of this study may be published or presented at public meetings, but any information that could result in your identification will remain confidential, unless you agree that any direct statements attributed to you are entirely accurate. If you have any questions about the study, you are welcome to contact me, the study's Principal Investigator. You can also contact PCS Staff: Asap Bukurrou, Tino Kloulchad or Lerince Kelmel.

Do you have any questions?

Is it okay with you if we proceed with the interview?

Reef Tenure

1. The questions in this interview focus on your knowledge of the past. Please describe what comes to mind when you think back to your earliest memories of fishing with your family.
2. Think of an instance when your village shared fishing areas with other villages during the past.

Probe: Why were these areas shared?

Probe: What did those people give your village in exchange?

Probe: Why was it important to share these areas with other villages?

Probe: How have reasons for sharing fishing areas changed from the past to now?

3. Describe the rules for fishing the reefs and lagoons owned by your village during the past.

Probe: What were the penalties for not following these rules for your village?

Probe: What were the penalties for those who were not members of your village?

4. Think of the marine areas your village owned during traditional times.

Probe: What is the history of your village's ownership there?

Probe: What were the different types of boats used to access these areas?

Probe: What were the different types of gear used in these areas?

Probe: Can you point to these areas on this aerial photo or map?

Other Traditional Management Practices

5. Think of ways your village worked with people from [Kayangel or Ngarchelong] on fisheries management in the past.

Probe: What were the occasions you worked together?

Probe: What was the benefit of working together?

Probe: Who did your village work with?

Probe: How has this management changed over time?

6. Were there any marine resources that your *keblil* (clan/lineage) had a taboo against eating during traditional times?

Probe: Why was there a taboo against these foods?

Probe: Did people follow these taboos?

Probe: What happened when these taboos were broken?

7. Think of other restrictions, such as *bul* (moratorium), for eating or harvesting marine resources that were used in the past.

Probe: Who set these restrictions?

Probe: What times of year were these restrictions in place?

Probe: Why were these restrictions used?

Probe: Did people follow these restrictions?

Probe: What happened when these restrictions were broken?

Enforcement

8. Tell me about a case of a marine rule, taboo or *bul* being broken during the past.

Probe: Who was involved in the enforcement?

Probe: What was enforced?

Probe: What was the result?

Probe: What would happen if such a case occurred today?

9. Describe how the chiefs managed the reefs your village used during traditional times.
Probe: What actions did these leaders take when fish stocks were in decline?
Probe: What actions did these leaders take in enforcement of rules?
Probe: How have these roles changed over time?
10. Describe how the State Government manages the reefs your village uses now.
Probe: What actions do these leaders take when fish stocks are in decline?
Probe: What actions do these leaders take in enforcement of laws?
Probe: How have these roles changed over time?
11. Describe how the National Government manages the reefs your village uses now.
Probe: What actions do these leaders take when fish stocks are in decline?
Probe: What actions do these leaders take in enforcement of laws?
Probe: How have these roles changed over time?
12. If your village could re-establish past systems of reef and lagoon ownership in future management, how would this help enforcement?
Probe: Who would be involved in re-establishing traditional ownership?
Probe: Who would be involved in enforcement?
Probe: What other past management practices would you re-establish?
13. What hamlet is your family from?
Probe: Where are your brothers, sisters and children living now?
Probe: If they don't already, do you think they will return to live in your hamlet in the future?

Is there anything else you want to share?

Thank you very much for your time!

Appendix 3

Interview Instrument 2:

Traditional Ecological Knowledge

1. Describe how you learned to [fish or reef glean].
 Probe: Who was there?
 Probe: How often did you go?
 Probe: How did this change as you grew older?

2. Describe how your children learned to [fish or reef glean].
 Probe: Who was there?
 Probe: How often did they go?
 Probe: How did this change as they grew older?

3. Describe how your great-grandchildren will learn to [fish or reef glean].
 Probe: Who will be there?
 Probe: How often will they go?

4. Describe the different types of [fishing or reef gleaning] you did depending on the tides in the past.
 Probe: What types of seafood did you [catch or gather] during an outgoing tide?
 Probe: What types of seafood did you [catch or gather] during an incoming tide?

5. How did your family use knowledge of the different phases of the moon in fishing in the past?
 Probe: What types of fishing did you do during *tabelbuil* (new moon)?
 Probe: What types of fishing did you do during *orakiruu* (full moon)?
 Probe: What types of fishing did you do during *mengeai* (first or third quarter)?
 Probe: How is the lunar calendar used to plan fishing trips now?

6. How did your family use the flowering or fruiting of different trees to signal changes in what marine resources were ready to be harvested in the past?
 Probe: What seasonal changes stand out most in your mind?
 Probe: How is this knowledge used by your children's generation?
 Probe: How could this knowledge be valuable for future generations to know about?

7. Describe a time when your family used knowledge of the behavior of a fish, turtle or invertebrate to catch or gather it in the past.
 Probe: Which animal's behavior stands out most in your mind?
 Probe: How is this knowledge used by your children's generation?

Probe: How could this knowledge be valuable for future generations to know about?

8. What were the different types of weather that required you to use different fishing gear in the past?

Probe: Why was different gear used?

Probe: What types of fish, turtles and invertebrates did you catch during various weather conditions?

Future Development and Management

9. How many meals do you eat, including fish caught by your family, during a typical day or week?

Probe: Three times/day? Once/day? Once/week?

Probe: How does this change throughout the year?

Probe: Why do you eat fish rather than canned or imported meat?

10. How many meals do you eat, including fish or meat from a store or market, during a typical day or week?

Probe: Three times/day? Once/day? Once/week?

Probe: What store or market does your family buy meat from the most?

Probe: Why do you eat these instead of locally caught fish?

11. Describe why you think reef fish from your village's lagoons should or should not be sold in Palauan stores and markets.

Probe: Why do you think they should or should not be sold internationally?

Probe: Why do you think they should or should not only be used on a subsistence/custom basis?

12. How does your family make money now?

Probe: How many members of your family work in Koror or Melekeok?

Probe: How many members of your family work for a paycheck in [Kayangel or Ngerchelong]?

Probe: How many family members contribute to supporting your family primarily through fishing and farming?

13. Describe any development projects you would like to see in your village within the next 20 years.

Probe: What kind of stores do you want to see for Palauans to shop in?

Probe: What kind of hotels & restaurants do you want to see for tourists to stay and eat at?

Probe: What kind of new homes, schools, and paved roads do you want to see?

Probe: Has your family recently developed or talked about developing their land

for business purposes?

14. Describe the future developments in your village you think would incorporate healthy marine resources.

Probe: Why are these valuable to you?

Probe: What parts of your village do you want to see undeveloped?

15. What level of school have you completed?

16. Which religion, if any, do you practice?

Is there anything else you would like to share? *Mesulang!*

Appendix 4

Palauan Glossary**Boats**

- Bilas*- slow wooden boat with four horsepower Yanmar diesel engine or equally slow boat
Cheludel- sail of boat made from Pandanus leaves
Cholechutel- raft of more than ten bamboo trees used for hauling heavy loads
Kaeb- large sailing canoe
Kotraol- small sailing and paddling canoe
Mlai ra bul- Southwest Island canoe
Totang- canoe made of corrugated tin

Fish

- Beduut*- forktail rabbitfish, *Signatus argenteus*
Berdebed- juvenile humphead parrotfish, *Bolbometopon muricatum*
Blilch- Engel's mullet, *Valamugil engeli*
Bsukl- soldierfish, *Myripristis spp.*
Budech- yellow-cheeked tuskfishes, *Choerodon anchorago*
Chai- large barracuda, *Sphyraena barracuda*
Chaol- young milkfish, *Chanos chanos*
Chedeng- generic term for shark
Chedoched- silver mokarras, *Gerres abbreviatus*
Chelas- convict surgeonfish, *Acanthurus triostegus*
Chemirchoech- small grouper, *Epinephelus merra*
Cheropk- giant trevally, *Caranx ignobilis*
Chersuuch- mahi mahi, *Coryphaena hippurus*
Chesall- Oyena mojarra or silverfish, *Gerres oyena*
Chesiklechol- crescent-banded grunter, *Terapon jarbua*
Chesuuch- big eye trevally, *Caranx sexfasciatus*
Chibars- spinedoth, *Pentapodus caninus* and *Scolopsis sp.*
Chidabl- threespot cardinalfish, *Apogon trimaculatus*
Chudech- yellow-line emperor, *Lethrinus obsoletus*
Chum- blue-spin unicornfish, *Naso unicornis*
Dech- yellowstripe goatfish, *Mulloidichthys flavolineatus*
Desui- rainbow runner, *Elagatis bipinnulatus*
Dukl- titan triggerfish, *Balistoides viridescens*
Erangel- orange-spine unicornfish, *Naso lituratus*
Itotech- blackspot emperor, *Lethrinus harak*
Katsuo- skipjack tuna, *Katsuwonus pelamis*
Katuu el tiau- saddleback grouper, *Plectropomus laevis*
Kedesau- large red snapper, *Lutjanus bohar*
Kelalk- black snapper, *Montaxis spp.*

Kelat- bluespot mullet, *Moolgarda sehelis*
Kemedukl- humphead parrotfish, *Bolbometopon muricatum*
Keremlal- red humpback snapper, *Lutjanus gibbus*
Keskas- wahoo, *Acanthocybium solandri*
Kieu- halfbeak, *Hemiramphus far*
Klsebuul- rabbitfish, *Siganus lineatus*
Komud- rudderfish, *Kyphosus cinerascens* and *K. vaigiensis*
Maml- large humphead wrasse, *Cheilinus undulates*
Matukeoll- blacktip reef shark, *Carcharhinus melanopterus*
Meai- barracuda, *Sphyraena sp.*
Meyas- rabbitfish, *Signaus fuscescens*
Mechur- yellowlip emperor, *Lethrinus xanthochilus*
Mekebud- small herring, *Herklotischthys quadrimaculatus*
Melangmud- long nose emperor, *Lethrinus elongates*
Mellemau- Bleeker's parrotfish and bullethead parrotfish, *Scarus bleekeri* and *S. sordidus*
Mengardecheluche- peacock grouper, *Cephalopholis argus*
Mesekelat- milkfish, *Chanos chanos*
Mesekuuk- ring-tailed surgeonfish, *Acanthurus xanthopterus*
Mirechorech- small honeycomb grouper, *Epinephelus merra*
Ngelngal- king mackerel, *Scomberomorus commerson*
Ngimer- juvenile humphead wrasse, *Cheilinus undulates*
Ngioach- Pacific longnose parrotfish, *Hipposcarus longiceps*
Ochiaeiu- spotted eagle ray, *Aetobatus narinari*
Oruidel- bluefin trevally, *Caranx melampygus*
Rrai- summer flounder, *Paralichthys dentatus*
Smach- striped mackerel, *Rastrelliger kanagurta*
Tekuu- large yellowfin tuna, *Thunnus albacares*
Temaitolok- sardine, *Blenidae sp.*
Temeikai- grouper, *Epinephelus spp.*
Terekrik- scad, *Selar crumenophthalmus*
Tiau- grouper, *Plectropomus spp.*
Uloi- archerfish, *Toxotes jaculatorix*
Uluu- yellowtail mullet, *Ellochelon vaigiensis*

Gear

Berdakl- small nets, weighted at the bottom, used to wrap around rocks
Bidekill- cast net
Boes ra ngikel- speargun for fishing
Bub- fish trap made of bamboo
Chirchocher- fish hooks
Derau- fishing net
Drek- net made of coconut fiber rope
Kerreel- coconut fiber rope

- Kesokes-* set net made of coconut fronds twisted around a cord, used to gather fish into a corner where fishermen would spear them
- Klibiskang-* single pronged spear
- Klloiskang-* special small throw spears used near the mangrove
- Mengereel-* fishing method in which one casts over shallow water with a light line and hook size less than no. 5 with optional weight attached
- Ometilab-* fishnet made of coconut fiber rope used to surround fish
- Olaod-* spear to catch sardines
- Oltoir-* fishing method in which one watches ripples on the surface, makes a chase and lightly races over the reef and throws a spear
- Omdesakl-* fishing method using heavier line and a small weight just above a large hook, sized 6-8
- Ruul-* sweep net made of coconut and other palm leaves extending 30 feet long
- Sab-* fishing net
- Taod-* multipronged fish spear
- Usebuu-* net made of palm leaves

Habitats

- Cheleu-* deep portions inside the reef with white ocean floor
- Chelmoll-* barrier reef where waves break
- Chis-* depressions in the reef where shallow pools form near shore at low tide
- Lolou-* outer edge of the mangrove
- Lemau-* small, deep spot within shallow area inside reef
- Lkes-* exposed sandbar
- Mengeai-* neap tide
- Odesongel-* stone platform
- Taoch-* mangrove channel
- Uet-* depression in the seafloor close to mangroves

Invertebrates

- Bakelungal-* black teatfish sea cucumber, *Holothuria nobilis*
- Buich-* tiger cowrie shell, *Cypraena tiger*
- Chemang-* mangrove crab, *Scylla serrata*
- Cheremrum-* small black sea cucumbers, *Actinopyga miliaris* and *Actinopyga echinates*
- Chesechol-* white beach clam, *Atactodea spp.*
- Chesechuul-* ghost crabs, *Ocypode spp.*
- Choalech-* long spined black sea urchin, *Diadema sp.*
- Duadeb-* giant clam, *Hippopus hippopus*
- Ibuchel-* short spined sea urchin, *Tripneustes gratilla*
- Irimd-* sea cucumber, *Stichopus spp.*
- Ketat-* coconut crab, *Birgus latro*
- Kikoi-* ark shells, *Anadara sp.* and *Barbatia sp.*
- Kism-* clam shell or giant clam, *Tridacna derasa*

Kmai- swimming blue reef crab, *Portunus pelagicus*
Luut- squid, *Sepioteuthis sp.*
Melibes- giant clam, *Tridacna maxima*
Meremarech- sea cucumber, *Bohadschia argus*
Molech- white sea cucumber, *Holothuria scabra*
Ngduul- mangrove clam, *Anodontia philippina*
Ngimes- sea cucumber, *Stichopus variegates*
Oruer- giant clam imbedded in coral, *Tridacna crocea*
Otkang- largest giant clam, *Tridacna gigas*
Rekung 'l daob- brown land crab, *Cardisoma hirtipes*
Ribkungel- giant clam, *Tridacna squamosa*
Sachesachera – sea cucumber from *Ngetmel* seagrass beds
Sang- spider shell, *Lambis lambis*
Senum- trochus, *Trochus niloticus*
Temitamel- prickly redfish sea cucumber, *Thelenota ananas*

Plants

Brak- large yellow taro, *Alocasia macrorrhiza*
Klebau- breadfruit tree, *Artocarpus sp.*
Meduu- breadfruit tree, *Artocarpus altilis*
Miich- tropical almond tree, *Terminalia catappa*

Reptiles

Melob- green turtle, *Chleonia mydas*
Ngasech- hawksbill turtle, *Eretmochelys imbricata*

Titles

Kebliil- clan
Klechedaol- visiting guests
Machas- respected female elder
Ngaraderbei- council of 10 chiefs of *Ollei*
Ngaralei- copra planting organization between Kayangel and *Ollei*
Ngarangeseu- organization between Kayangel and *Ollei*
Remechesengel- title holder in Kayangel who can divert storms and currents
Rubak- respected male elder

Appendix 5

IRB Human Subjects Letter

**Office of the Provost
Associate Vice President
Graduate Studies & Research**

One Washington Square
San José, CA 95192-0025
Voice: 408-924-2427
Fax: 408-924-2477

E-mail: gradstudies@sjtu.edu
<http://www.sjtu.edu>

To: Robin Carol Putney
1265 Military Ave #B
Seaside, CA 93955

From: Pamela Stacks, Ph.D.
Associate Vice President
Graduate Studies and Research

Date: November 17, 2006

A handwritten signature in black ink, appearing to read "Pamela CStacks".

The Human Subjects-Institutional Review Board has approved your request to use human subjects in the study entitled:

"Role of Customary Marine Tenure and Marine Protected Areas in the Co-management of the Northern Reefs of Palau"

This approval is contingent upon the subjects participating in your research project being appropriately protected from risk. This includes the protection of the anonymity of the subjects' identity when they participate in your research project, and with regard to all data that may be collected from the subjects. The approval includes continued monitoring of your research by the Board to assure that the subjects are being adequately and properly protected from such risks. If at any time a subject becomes injured or complains of injury, you must notify Dr. Pamela Stacks, Ph.D. immediately. Injury includes but is not limited to bodily harm, psychological trauma, and release of potentially damaging personal information. This approval for the human subject's portion of your project is in effect for one year, and data collection beyond November 17, 2007 requires an extension request.

Please also be advised that all subjects need to be fully informed and aware that their participation in your research project is voluntary, and that he or she may withdraw from the project at any time. Further, a subject's participation, refusal to participate, or withdrawal will not affect any services that the subject is receiving or will receive at the institution in which the research is being conducted.

If you have any questions, please contact me at (408) 924-2480.

cc. Katherine Kao Cushing, WSQ 115C-0115

The California State University:
Chancellor's Office
Bakersfield, Channel Islands, Chico,
Dominguez Hills, East Bay, Fresno,
Fullerton, Humboldt, Long Beach,
Los Angeles Maritime Academy,
Monterey Bay, Northridge, Pomona,
Sacramento, San Bernardino, San Diego,
San Francisco, San José, San Luis Obispo,
San Marcos, Sonoma, Stanislaus

Appendix 6

Transcript Coding Example

likes speargun fishing, and hook and line fishing. We don't really know, because kids today have a lot of wants. If they want something and have money they just go and buy it, so there's no need to go fishing, they just order and buy the fish. It is then hard for us to decide what and how to teach our grandchildren. People like us who enjoyed fishing want to go fishing, but children today just idle around and go to the fish market to buy their fish.

Methods
Sale
TEK
Sale

R:

T: Describe the different methods of fishing you used in the past when you went fishing depending on high and low tide conditions.

K:

That's right, because of the tools, we depend on the tide that is suitable for certain fish. For example, if we use "kesokes (coconut fronds twisted around a cord and spread out like a net)," we have to go when the tide is high and set the "kesokes", when the tide recedes, the fish will come in and form a school in one corner, so we go and spear them, unlike using the contemporary fishing net in shallow water, that when the tide recedes, fish would be trapped on the net itself. Sometimes we go to the dock, and they would say "we have missed the tide so we'll go tomorrow." When they say "we have missed the tide" it means we do not have enough time to reach the fishing area in time because we polled our canoe. Today it's different, we wait until the last minute, get on the speed boat and race to the site, spread the net and fish. It is really different today than in the past.

methods
TEK
boats

R:

T: What kind of fish or sea food do you get when the tide is low or going out?

K:

Mostly reef fish, you get when the tide is low, but for migratory fish in the deep you get by trolling or diving, high tide is preferable because you do not dive when the tide is low. Those are the methods, when you use spear gun you go to the deep when the tide is low, but for rabbit fish (meas—*Siganus canaliculatus* and klsebuul—*Siganus lineatus*), we ensnare them because they are going out. We follow their way out and use net.

TEK
methods

R:

T: When the tide is high or is coming in, what do you get?

K:

When the tide is coming in, if we are fishing with hook and line, we go for paddle tail snapper (keremla—*Lutjanus gibbus*) before they are scattered in the reef. They are the fish that come up the the reef and go down in the deep. If the tide is high, you decide, "Should I go for turtle, or what else can I do. So