Our Environment, Our Home, Our Future: OUR PALAU

Proceedings & Findings of the 1st National Environment Symposium

August 23 & 24, 2016
Koror, Palau

Hosted by the
National Environmental Protection Council

In collaboration with
Rubekul Belau
and the
Palau Conservation Consortium

Contents

INTRODUCTION

Our Environment, Our Home, Our Future: OUR PALAU

Demonstrating the remarkable power of collaboration and big thinking that Palau so often exhibits, in 2016 a diverse partnership produced the nation's 1st National Environment Symposium. The event brought together conservation groups, national leaders, business owners, and community members for intimate discussion and respectful debate on the successes, challenges, and opportunities facing Palau's environment. Participants reiterated the importance of the natural environment to Palau's culture and identity, and agreed that ongoing collective effort will preserve natural resources for future generations. The output of the symposium included better direction and prioritization that will guide improved conservation action by the government and the public alike.

National Environmental Protection Council

Rubekul Belau

Palau Conservation Consortium

National Government

Traditional Leadership

Community and Resource Practitioners

The Public *in person and via WAVE Radio & Eco FM*

1ST NATIONAL ENVIRONMENT SYMPOSIUM

August 23-24, 2016
Koror, Palau

Why hold a National Symposium?

To improve the effectiveness of ongoing conservation efforts &

To ensure that conservation is translated into benefits for Palauans

Image Credits

Cover	Symposium participants © PICRC Orange background © Shutterstock/Your Artist
2 & 20	Puzzle graphic © Shutterstock/ GN Illustrator Turtles and Sailing, taken from an A Uel a Sechelid poster © Margo Vitarelli and PCS'
3	Symposium participants © PICRC Arrow © Shutterstock/Your Artist
5	Timeline © Shutterstock/Karolina Madej
6	3-D Pie Chart © Shutterstock/Robuart
7-9	Symposium participants © PICRC Birkeland © https://manoa.hawaii.edu/biology/people/charles-birkeland Fisheries catch; Grouper © PICRC Invasives control © PCS Dancers; Koror Aerial © Shutterstock/Photosounds Snorkeler © Shutterstock/Blue Orange Studio Cow and Machinery © Anuradha Gupta Airport Solar © Kyocera Waves © Shutterstock/PFShots
10	Venn Diagram with inner graphics © Vecteezy Taro leaf © Shutterstock/Iva Villi Holding hands © Shutterstock/File404 Black Icons © Vecteezy
11	Snorkeling researcher © Troy and Jamie Payne Family in taro patch © Ann Singeo Adult and child © Hanna Muege
12-13	Arrow; Toolbox; Camera; Black fish icons © Vecteezy Blue fish © Shutterstock/Anna Poguliaeva Tattoo fish © Shutterstock Ebiil map © PALARIS Tuna fishing photos from Yvonne Ueda presentation
14	People thinking © Shutterstock/ Igor Kisselev Teacher © Shutterstock/ TheLastWord Handshake; Coral; Seagrass icons © Vecteezy Up & Down triangles © Shutterstock/ Markova Palau map © PALARIS Solar panels © Shutterstock/ Martina Vaculikova
15	Flyway & Shorebird photos from Heather Ketebengang presentation Diver © Shutterstock/ Iryna Khomenko
16	Purple coral © Shutterstock/ Aliaksei Tide graphic © Shutterstock/ Designua Algae icons © Vecteezy
17	Photographs from Staci Lewis presentation: Taking cores. © Staci Lewis. Construction © Staci Lewis. Ngeremeduu Bay aerial © Dr. Pat Colin Watershed graphic © Shutterstock/ Crystal Eye Studio Beetle image and graphs from Olkeriil & Moses presentation Coconut Tree © Vecteezy
18	Battery icon © Shutterstock/ Robuart Graph © Shutterstock/ Martina Vaculikova Scale © Vecteezy Bent arrows © Shutterstock/ Ovchinnkov Vladimir
19	Jellyfish © Vecteezy Water droplet © Shutterstock/ Itana 3D Map of Melekeok © The Nature Conservancy. Image from PANORAMA | Solutions for a healthy planet | http://panorama.solutions/en/solution/participatory-3d-mapping-land-use-planning-and-climate-change-adaptation
21	Spearfisher © Vecteezy Tattoo marlin © Shutterstock Blue fish © Shutterstock/ Anna Poguliaeva
22	Green development circle © Shutterstock/Surasswadee Green leaf icon © Shutterstock/ Martina Vaculikova
23	Black icons © Vecteezy Palau Mariculture Center images from http://www.fish-engn.co.jp/project_list_e.html
24	Urban city skyline © Vecteezy Green recycling and trash icons © Shutterstock/Martina Vaculikova Test tubes © Shutterstock/
25	Palm trees © Shutterstock/ Iness Fishing trap, located at Etpison Museum. Image from http://www.pacificworlds.com/palau/sea/fishing.cfm
26-27	Symposium participants © PICRC Staircase © Shutterstock/ Jennifer Gottschalk Soft coral © Shutterstock/ Ethan Daniels
37	Abai © Shutterstock/ RWBrooks
43	Palau island and water view © Shutterstock/ Ethan Daniels

Message from the Planners

This Symposium represented an unprecedented collaborative effort among government, community groups, and traditional leaders to shift our thinking and perspective: **To redefine Palau's environment for Palauans today and tomorrow.** We thought less about facts but more about meaning; focused less on places but more on links. Our goal was to connect the activities of practitioners to the daily livelihoods of beneficiaries. We tied **the environment we see** to **the services we live by**.

With over 200 participants with much to say over two days, we could not capture all ideas in this Report. What we can provide is a snapshot–in written language and graphics–of the spoken words, images, ideas, and feelings that we experienced during the Symposium.

Most of all, the Symposium excited our spirit of collaboration, strengthened our sense of urgency; and reinvigorated our sense of hope. We concluded with a **collective call to action–by Palauans, to Palauans.**

National Environmental Protection Council	Rubekul Belau	Palau Conservation Consortium
20 *members*	**16** *members*	**40+** *members*

Background & Planning

Survey

The Palau International Coral Reef Center (PICRC) conducted a survey on behalf of the planners to identify priorities for the Symposium Program. The survey was emailed to 204 individuals at a range of government and nongovernment groups. Survey results were used to narrow down a Call for Abstracts and to identify needed speakers, panels, and information sessions.

The Survey response rate was 22%, from 46 individuals representing 35 organizations/groups.

Program

Day 1 highlighted challenges, scientific findings, and ongoing efforts on six Issues Themes: 1) Fisheries, 2) Partnerships: Community, State & National Programs, 3) Community Actions, 4) Disturbance & Threats, 5) Making the Case for Change, and 6) Climate Change: Impacts and Community-based Adaptation Strategies. Day 2 focused on identifying priorities and more effective conservation solutions in three cross-sector Solution Themes: 1) Sustainable Fisheries, 2) Smart Growth, and 3) Sustainable, Profitable, and Equitable Tourism. *See Appendix 2 for the full Program.*

Plenary sessions celebrated Palau's successes and "Bright Spots."

Day 2 included the official launch of three national documents:

PAN Status Report 2003-2015

Palau's NBSAP 2016-2026

Palau Climate Change Policy

By Executive Order, the NEPC is comprised of directors and heads of national government agencies and corporations. Rubekul Belau is comprised of Traditional Leaders, and the Palau Conservation Consortium is an informal group of conservation practitioners, business owners, and concerned citizens.

38 abstracts were submitted (See Appendix 1). ***The Symposium was organized into 6 Issue Themes and 3 cross-sector Solution Themes.***

The NEPC agreed to incorporate Symposium priorities and recommendations into its annual work plans.

Planning

The National Environmental Protection Council (NEPC) began planning in July 2017, initially to help the public understand the international attention Palau's conservation sector had generated in the previous five years. To broaden the perspective and relevance, the NEPC asked Rubekul Belau and the Palau Conservation Consortium to collaborate.

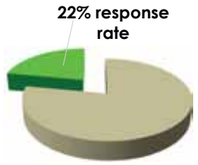
Abstracts

A Call for Abstracts was released in August 2016, inviting presentations on 13 topics: 1) Protected Areas Network (PAN), 2) Research, 3) Community and State Conservation Initiatives, 4) Palau National Marine Sanctuary (PNMS), 5) Community Outreach and Awareness, 6) Overharvesting/Overfishing, 7) Sewer, 8) Tourism impacts, 9) Climate Change, 10) Sedimentation/Erosion, 11) Water Resources, 12) Development, and 13) Land-use planning.

Symposium

The Symposium was held at the Palasia Hotel on August 23 and 24, 2016. Participants included 47 speakers and Panel members/moderators out of 200+ total participants, including several youth presenters (*See Appendix 3*). Members of the public also called in via a special radio hotline.

Survey Results



A pre-symposium survey was emailed to 204 individuals, with a response rate of 22%.

The survey asked two questions:

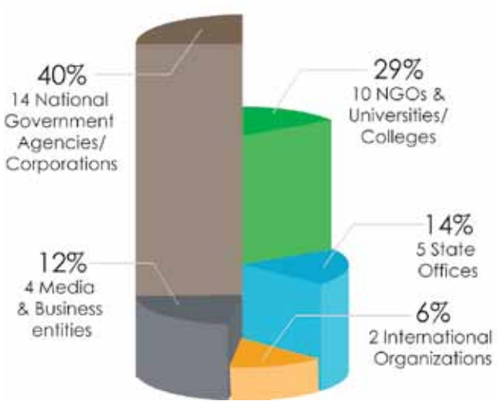
1. *What do you think are the big successes in environmental conservation in Palau? (List up to 3)*
2. *What are your top environmental issues and why are they important? (List up to 3)*

Number of Survey respondants

46 people responded to the survey

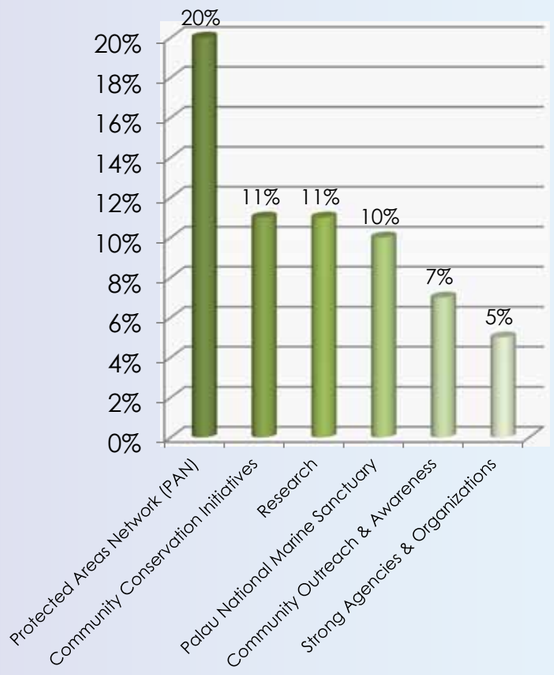
Type of Organization Represented

Individuals from 35 organizations responded to the survey



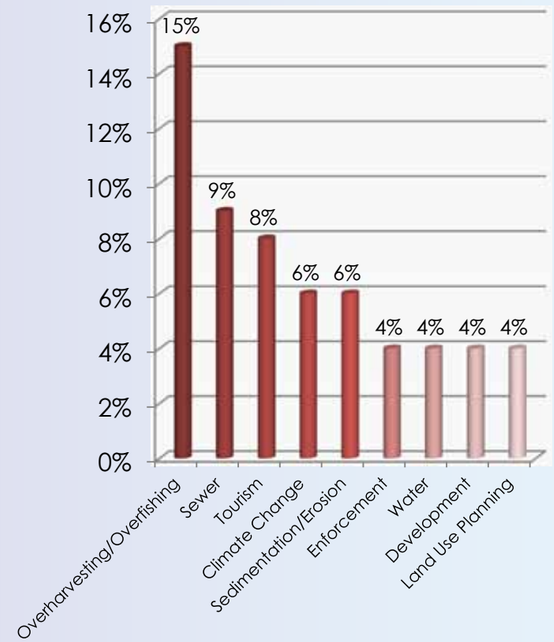
Palau's Most Successful Initiatives

A total of 122 initiatives were listed by survey respondents



Top Challenges Facing Palau

A total of 124 challenges or threats were listed by survey respondents



Day 1: Challenges & Ongoing Efforts

Opening Remarks
Honorable Umiich Sengebau
Minister of MNRET & Chair of NEPC

Special Remarks: Recognizing Our Own Good Efforts
His Excellency Tommy E. Remengesau
President of the Republic of Palau

Special Presentation:
An Overview of Research & Conservation Efforts in Palau since the 1990s: An Outsider's Perspective
Dr. Robert Richmond
Professor, Kewalo Marine Lab, U. Hawaii

Survey Results that Shaped the Symposium
Dr. Yimnang Golbuu
CEO, Palau International Coral Reef Center

Issues Panels

Fisheries
Contributors: The Nature Conservancy (TNC) Micronesia, PICRC, Coral Reef Research Foundation (CRRF), & University of Queensland

Partnerships: Community, State & National Programs
Contributors: Palau Conservation Society (PCS), Global Environment Facility Small Grants Programme (GEF SGP), & PICRC

Community Actions
Contributors: Koror State Government, PCS, TNC Micronesia, PICRC

Disturbance & Threats
Contributors: PICRC, CRRF, Stanford U., U. of Queensland, & Mindszenty High School (Student)

Making the Case for Change
Contributors: Palau Conservation Consortium, Planet Blue Kayak Tours, The Environment, Inc., & PCS

Climate Change: Impacts & Community-based Adaptation Strategies
Contributors: NEPC, CRRF, U. of South Pacific, & Ngardok Nature Reserve (Melekeok State)

Day 2: Priorities & Solutions

Program Overview

Opening Remarks
Beouch, Kyoshi Rechucher
Rubekul Belau

Special Remarks: Gathered Here with a Common Goal
His Excellency Tommy E. Remengesau
President of the Republic of Palau

Special Presentation: Working With, Not Against, Coral Reef Fisheries
Dr. Charles Birkeland
University of Hawaii

Launching Presentations:
1) Protected Areas Network (PAN) Status Report, 2003-2015
2) Palau's National Biodiversity Strategies & Action Plan (NBSAP) 2016-2026
3) Palau Climate Change Policy for Climate & Disaster Resilient Low Emissions Development
Honorable Elbuchel Sadang *(overview)*

Solutions Panels

Sustainable Fisheries for Food Security
Contributors: TNC Micronesia, Northern Reefs Fisheries Cooperative, & Bureau of Marine Resources,

Laying the Groundwork for Smart Growth
Contributors: Environmental Quality Protection Board (EQPB), Koror-Airai Sanitation Project, PPUC, & Bureau of Public Works

Ensuring our Tourism Industry is Sustainable and Profitable for Everyone
Contributors: PCS, Bureau of Tourism, Ngardok Nature Reserve (Melekeok State)

Governor's Association Response
Honorable Yoshitaka Adachi, *Koror*
OEK House of Delegates Response
Honorable Lentser Basilius, *Melekeok*
OEK Senate Response
Honorable Jerrlyn Uduch Sengebau Senior

Priorities & Recommended Actions

Priorities Identified at the Symposium

In addition to information exchange and identification of priority issues and solutions, the Symposium provided a unique platform for discussion among diverse groups. Priorities listed here will be incorporated into National Government and NGO work plans, and many States, community groups, and individuals pledged to incorporate symposium findings into their activities.

Fisheries

1. Improve data availability on fisheries through continued assessment of fish stocks and management actions.
2. Promote development of clam aquaculture, with clear benefits for Palauans, for both reef reseeding and for restaurants.
3. Further develop a domestic tuna fishery, both for restaurant production and to reduce pressure on reef fisheries.
4. Examine whether Marine Protected Areas are enough to protect marine resources, and explore non-MPA management options.
5. Increase use of non-MPA tools such as harvesting/tool/species bans, gear restrictions, size limits, catch limits, etc.

Partnerships: Community, State & National Programs

1. Maintain strong partnerships between states, governments, and nonprofits. Improve partnerships between management organizations and the private sector.
2. Improve land practices to minimize erosion and sedimentation.
3. Prioritize management effectiveness of those MPAs with low ecological scores or of ecological types that are not well represented. Site new MPAs far from river discharge areas and land.
4. Increase MPAs that protect lagoon and reef flats.
5. Continue providing technical and financial support to community initiatives (e.g. GEF SGP).
6. Continue environmental education, with links to other sectors (e.g. health, climate change).

Community Actions

1. Celebrate community-driven discoveries, such as the finding of Peleliu Lkes as a rich biodiversity area, and the "discovery" of the Palau eel.
2. Support community management of Peleliu Lkes.
3. Continue to seek co-management of reef resources by adjacent states.
4. Increase internship programs for youth.
5. Recognize that the efforts of NGOs and both local and international wildlife enthusiasts are essential to Palau's environment, economic, and conservation sectors.

Disturbance and Threats

1. Agencies need to put special focus on herbivorous fish protection.
2. Prevention of disturbance to coral reefs is the most effective method for helping reefs recover.
3. Take more pro-active steps to reduce sedimentation from land.
4. Conduct more research on Coconut Rhinoceros Beetles.

Making the Case for Change

1. Assess the Environmental Impact Assessment (EIA) process.
2. Improve the EIA process, including a) more clear reporting, b) follow-up, c) public empowerment, d) additional trained staff, e) sufficient budgets, f) effective information dissemination, g) improved coordination, and h) a communication system.
3. Have Respect, Patience, and Karma!

Climate Change: Impacts & Community-based Adaptation Strategies

1. Communities can take action on their own; they don't need to wait for the national government to initiate programs.
2. Food and Water Security Programs must be prioritized.

Sustainable Fisheries for Food Security

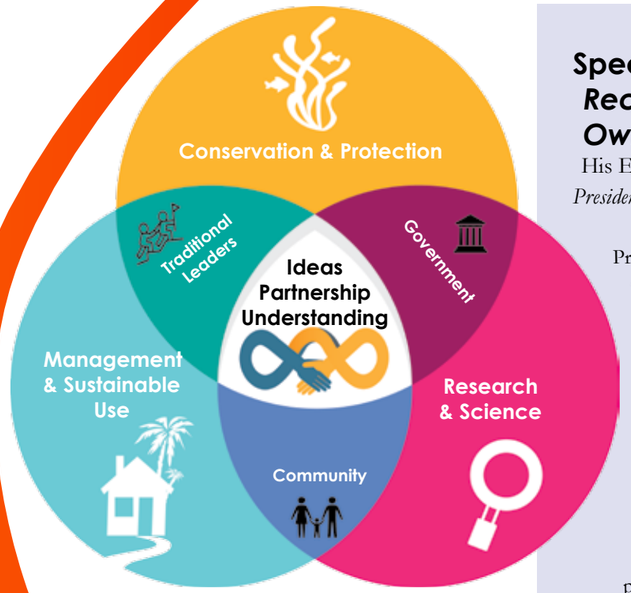
1. Develop a comprehensive framework for fisheries management.
2. Develop a domestic market for fish harvested in the Domestic Fishing Zone.
3. More strongly enforce existing laws.
4. Increase focus on reducing reef fish consumption (especially hotels/restaurants).
5. Continue financial and technical support for local initiatives (such as the Northern Reefs Fisheries Cooperative).
6. Vary and increase more targeted awareness efforts to specific audiences.
7. Support more learning exchange programs to support information and skill exchange and to build better relationships between the national government and communities.

Laying the Groundwork for Smart Growth

1. Improve water quality data to support better informed decision making.
2. Work with State Governments so they better understand and embrace Water Quality Regulations, including working to improve land management efforts at all levels (community to government and developer actions).
3. Proactive effort should be placed into developing Master Plans, Land Use Plans, and Marine Spatial/Marine Resource Use Plans. The plans should dictate investment; it should not be investment opportunities that dictate the plans.
4. Land use and marine planning must proactively account for Climate Change and Disaster Risk Management.

Ensuring our Tourism Industry is Sustainable and Profitable for Everyone

1. Support locally owned and operated eco-tourism.
2. Increase high-end tourism, use a Community Benefit Index to determine whether benefits will accrue locally.
3. Support development of niche- and community-based tourism products.
4. Expand on State programs such as that in Melekeok (State Tourism Symposium & Responsible Tourism Campaign) to identify driving causes for threats from tourists and solutions that benefit communities and the industry.



Opening Remarks

Honorable Umiich Sengebau
Minister of MNRET and Chair of the NEPC

Minister Sengebau opened the 1st National Environment Symposium by conveying his confidence that participants would gain new insights on the importance of the environment to Palau, as well as generate new solutions for environmental challenges.

The Minister outlined how this National Environmental Symposium builds upon the many environmental conferences and meetings that Palau has hosted in the past decade, most of which were focused on a single topic and organized by a single group. This Symposium was unique because it was planned through a partnership among the National Government, Traditional Leaders, and Community Organizations. The Symposium offered attendees the opportunity to learn about and discuss a wide range of topics, from conservation to management to research, in an effort to both look back at past successes and challenges, and look forward to new solutions.

Special Remarks: *Recognizing Our Own Good Efforts*

His Excellency Tommy E. Remengesau
President of the Republic of Palau

President Remengesau acknowledged the past efforts of Palau's conservation community and partners, saying "Their efforts have shaped policies and improved Palau's environment for the well-being of Palauans." Just as it is easy to take Palau's beauty and uniqueness for granted, he also encouraged Palauans to better recognize "the good work we do," rather than only appreciating our own efforts after others do. "It is time that we, Palauans, recognize our own good efforts – so we can be excited about the good work we do and encouraged to continue our efforts in the important work of protecting our environment."

President Remengesau reminded us that underlying all of Palau's issues–health, economy, and education–is our environment, saying "Our environment determines our health; our environment determines our economy; and our environment is the basis of our cultural heritage and identity. It is our environment that is the means of our survival as Palauans. The work we do for our environment is for our people and our future."

President Remengesau encouraged Palauans to do more to put science into practice, and to use the evidence and knowledge gained from our work to inform our actions and behavior.

He asked the audience to imagine our children—and children's children—growing up in a world without resources in the ocean and on land, where there are no fish on the reefs and no farming on land. Rather than realizing this bleak future, it is better to recognize that we are still able use these resources and access these benefits; thus we have to act.

President Remengesau pointed out that in Palau, it is people who are still living off the land and oceans who are least likely to suffer from non-communicable diseases (NCDs). This is evidence that we have to go back to what makes us strong and healthy: our land, ocean, and resources. He called on the audience to continue to help to protect our environment and congratulated them on the fact that their important work matters!

Day 1 Plenary

Special Presentation: *An Overview of Research & Conservation Efforts in Palau since the 1990s: An Outsider's Perspective*

Dr. Robert Richmond
Professor, Kewalo Marine Lab, University of Hawaii

Professor Richmond applauded Palau's successful bottom-up approach to conservation, noting that Palau is unique because of significant involvement of traditional leaders and women's groups. Thirty years ago, Professor Richmond personally witnessed the power of women traditional leaders, when they successfully stopped a proposed Australian project to incinerate toxic waste in Palau.

Professor Richmond celebrated President Remengesau for receiving the first-ever standing ovation at the 13th International Coral Reef Symposium. Over 2,000 scientists heard his message that "knowledge alone is not enough and we must take action." Professor Richmond declared that Palau is a leader in bringing knowledge into action and policy. He illustrated this with four examples:

1. Despite massive coral bleaching after the 1998 El Niño, many of Palau's reefs have recovered. Palau's 20-history of coral research and consistent monitoring helped track and maximize reef resilience. Palau is a "Bright Spot" in the Pacific.
2. Nikko Bay in Koror has more kinds of corals than in all of Hawaii and the Caribbean combined. This knowledge has contributed to management to reduce local stressors.
3. An Airai Bay study found that mangroves trap up to 30% of sediment from erosion, influencing mangrove protection and contributing to the push for land use planning.
4. Palau's Taro fields can catch 60-90% of sediment. This information resulted in a project to relocate taro fields upland as an adaptation to climate change. This project models how Palau uses modern science and traditional knowledge together, through community partnerships, to achieve joint benefits. Other islands, like Hawaii, are learning from Palau's example.

In these examples, both scientific knowledge and traditional knowledge influenced policies, which were made possible because of the involvement of communities, women's groups, and traditional leaders. Professor Richmond encouraged Palau to continue to apply this model to minimizing local stressors to reduce threats exacerbated by climate change.

Professor Richmond compared his experience in the two capitols of the United States and Palau: "In DC, the impact of decisions made is restricted to sole responsibility. On the other hand, intergenerational responsibility legacy is strong and felt deeply in Palau." Local capacity is high, leading to a generation of Palauans who are growing up to continue the legacy of putting knowledge into practice.

Professor Richmond also discussed ongoing studies, such as a project to release and track grouper larvae. 30% of grouper spawn return to Palau, particularly the Northern Reefs, and it seems the larvae sense or smell healthy reefs. To counteract the negative impacts of Climate Change, which are guaranteed under future scenarios, local stressors must be reduced. He concluded by reflecting on Ngerukuid Islands Wildlife Preserve, which represents taking the best of the past and the best of the present to chart a better way forward into the future.

Photos
Right top: Active engagement of communities, women's groups, and traditional leaders.

Right bottom: Embracing intergenerational responsibility.

Left bottom: Translating science and knowledge into policy.

Survey Results that Shaped the 1st National Environment Symposium

Dr. Yimnang Golbuu
CEO, PICRC

Dr. Golbuu explained how planning for the 1st National Environment Symposium had been data-driven, based on the results of the pre-symposium survey (*see page 6*).

Robert Swan, explorer:

"The greatest threat to our planet is the belief that someone else will save it."

In discussing the identified successes, Dr. Golbuu noted the utility of highlighting successes, identifying lessons learned, and using them to inform future work. Dr. Golbuu was not surprised to see the PAN identified as a top success, despite ongoing challenges, because the work of PAN involves many people and partnerships from national to state levels. He was also pleased to see that "strong agencies and organizations" were ranked successful, meaning that more and more people recognize that there are local organizations with the capacity to do good work.

Dr. Golbuu outlined the purpose of the Symposium: identification of clear priorities, needs, roles, and partnerships; and how we can work together to address challenges.

This is why our theme is:

"Our environment, our home, our future, OUR PALAU."

We have to work together to do our part.

Fisheries Panel

Moderator:
Steven Victor, TNC Micronesia

Presenters:
Lukes Isechal, PICRC
Dawnette Olsudong, PICRC
Dr. Steven Linfield, CRRF
Mark Priest, U. of Queensland
Yvonne Ueda, TNC

The Fisheries Panel concluded with the undisputable fact that **fish stocks in Palau are still declining**, despite management efforts. A "Bright Spot," however, is that **Palau's institutions and partners have developed many of the tools and methods needed to better understand and manage fish stocks**. At the end of the Panel, Minister Faustina Rehuher-Marugg asked the question that was on so many minds: *For the community participants, who depend on these fish for their livelihood, what could be done more to further improve these efforts?* (Panels for improving fisheries management were already set for Day 2).

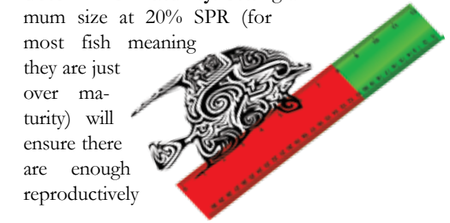
Researcher Lukes Isechal presented a "snapshot" study on fish harvests. There is **unsustainable demand on fisheries**, with a **high per capita fish consumption** rate (Palau is at 150 pounds/person/year, more than double the Pacific average), increased tourism-driven markets for reef fish, and fishers' concerns since the mid-1970s that fisheries were in decline. Currently there is **no fishery-based monitoring system for reef fish (e.g. counting fish caught)** to inform management (e.g. there are no catch limits based on population). The study indicated:

1. **A decline in herbivores, reducing reef resilience.**
2. **60% of fish landed in Ngarchelong were immature.**
3. **MPAs may not be enough to protect reef fish.**
4. **Stronger or additional tools are needed** (species and seasonal bans; gear restrictions, catch limits, and size limits (maximum/minimum)).

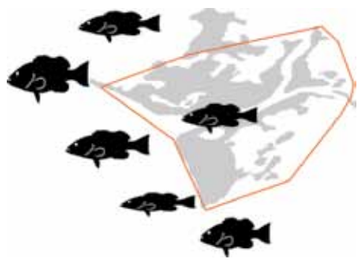
Isechal's study used innovative techniques, such as 3D video footage combined with catch-per-unit-effort surveys, to identify species that were potentially being over-exploited and recommended methods to improve monitoring.

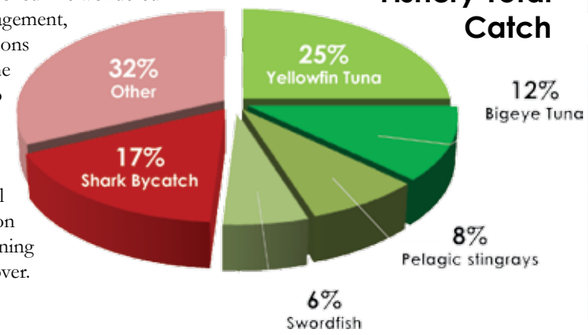
Research assistant Dawnette Olsudong presented an assessment of 190 sites in the Northern Reefs, where there was growing community concern that fish stocks were still declining. By examining the sizes of fish using techniques such as underwater video, the study found that **fish were generally smaller in areas that were fished compared to MPAs without fishing**. The greatest biomass was recorded on outer reef slopes. The most abundant fish were *Keremlal, Cherangel, Besechemel,* and *Um*.

Using the Northern Reefs as a Case Study, Biologist Steven Linfield explained the rationale behind minimum required sizes. His study from 2014 found that **many fish caught were immature.** In the Northern Reefs, **many targeted species were below the 20% threshold for Spawning Potential Ratios (SPRs), a tool to determine maturity.** Setting a minimum size at 20% SPR (for most fish meaning they are just over maturity) will ensure there are enough reproductively active fish to replenish the population. Methods currently exist for determining the size of maturity (which varies by species as well as by region), using techniques such as gonad analysis and filming by stereo-video. **In the Northern Reefs, there is enough data to set minimum size limits for 12 species.**



Starting with the sobering statistic that **worldwide 79% of fish spawning aggregations are in decline or have disappeared, with known declines in Palau**, PhD Candidate Mark Priest presented a study of groupers from the Northern Reefs. 40 individual *Tiau* were tagged at Ebiil Conservation Area and tracked for one year. *Tiau* used the spawning aggregation site year-round, but many were often **outside the boundaries of the conservation area just prior to spawning**. Males arrived at Ebiil 10 days and females arrived 3 days before aggregating; **females spent more time outside the MPA and were vulnerable for more days**. **MPA design must account for movement patterns** of reproductive migrating groupers. Priest noted that the decline in groupers seems to be stabilizing, possibly due to the MPA, PAN, or seasonal closures. *Yechad er Edukl* Francis Toribiong commented that he used to see spawning aggregations (such as *Maml)* at Ulong and German Channels, until they were overfished. He wondered whether, with management, spawning aggregations would ever come back. Toribiong also added that Ngarchelong State's recent complete closure of grouper harvest will provide information on whether spawning populations can recover.





Tuna Fisheries Improvement Coordinator Yvonne Ueda presented a study on tuna fishing methods. Through a partnership with MNRET and The Nature Conservancy (TNC), TNC bought 400 vessel days in Palau's longline tuna fishery to test bycatch mitigation. Observer data indicates that **Palau's tuna stocks are declining.** Catches by longliners in Palau include Yellowfin tuna (25% of the catch), Bigeye tuna (12%), pelagic stingrays (8%), and Swordfish (6%), plus **bycatch (17% of the total catch was sharks)**. Common bycatch included Blue and Silky Sharks and Olive Ridley sea turtles (5 sea turtle species were observed as bycatch). Ueda noted that **mitigation efforts do work:** for instance, after Palau banned shark fishing, the shark catch rate declined by 57%; 98% of caught sharks were returned to the sea; and 75% of those were alive when they were released. Research includes four experiments:

1. Use of Circle hooks instead of J-hooks.
2. Comparison of bait types (to minimize bycatch while maintaining economic viability of tuna catch).
3. Tagging of Blue and Silky Sharks caught as bycatch to determine their survival rates after release.
4. Varying time of day and depth of gear.

In addition to biological sampling of tuna, testing of electronic monitoring and reporting, market assessments, and FAD assessments, the results of these experiments will **identify best practices and contribute to environmental standards for tuna fishing** in Palau, especially under the Palau National Marine Sanctuary. Experiments were expected to finish in December of 2016.


Hook experiment


Bait experiment


Shark tagging


Time of day and Depth experiment


Biological Sampling

Partnerships Panel: Community, State & National Programs

Moderator:
Lolita Gibbons-Decherong, PCS

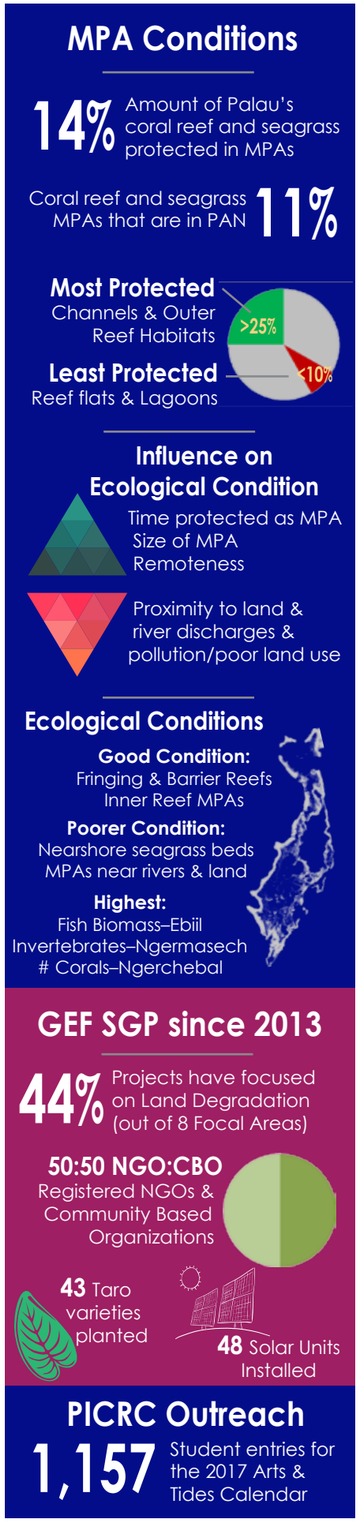
Presenters:
Victor Nestor, PICRC
Kiblas Soaladoab, GEF SGP
Ines Kintoki, PICRC

The Partnerships: Community, State & National Programs Panel examined the effectiveness of partnerships that are ultimately designed to raise the capacity of communities to make informed conservation and natural management decisions. These partnerships include a **variety of relationships** between government agencies, communities, States, and NGOs. Key to an effective partnership is having a **flow of information** and **clear pathways for information to become action**. The Panel concluded that these types of partnerships have **effectively protected reef resources**, but that expanded **partnerships between agencies/organizations and the private sector are needed**.

Researcher Victor Nestor presented a study on Marine Protected Areas (MPAs) showing they are a **good conservation tool**. Palau's Protected Areas Network (PAN) is the nation's keystone government-state-community partnership to support conservation. The study established baseline conditions for coral reef and seagrass MPAs, investigated drivers of ecological conditions, and used this information to identify improved management actions. Nestor presented key findings, such as sites with **low MPA coverage (reef flats and lagoon) and with poorer ecological conditions (seagrass beds).** Audience participants noted that communities are an important part of effective conservation–the study examined socioeconomic aspects separately–and that partnerships help align local to global objectives and help route limited resources to sites with the greatest local impacts.

National Coordinator Kiblas Soaladoab presented on impacts of projects financed through the Global Environment Facility Small Grants Programme (GEF SGP), which **exclusively supports community and nongovernment projects**, which must have co-finance and partnerships. Since 2013, when Palau's Country Program was established, 25 projects have been financed; 12 were women-led and 1 youth-driven. 718 people have been directly supported. The Country Program is guided by a participatory/adaptive strategy.

Assistant Communications and Outreach Officer Ines Kintoki presented an overview of educational services offered by PICRC, including the Arts & Tides Calendar, school visits, and hands-on lab visits; both basic environmental knowledge and cutting edge technical research findings are communicated regularly. PICRC's programs illustrate a successful partnership that has led to **links between education and information, public inspiration and action, and resulting research and more information**.



> **"Palau is a biodiversity wonderland. Efforts from NGOs and wildlife enthusiasts are essential."**
> **Panel Conclusion**

Community Actions Panel

Moderator:
Collin Joseph, Koror State Government

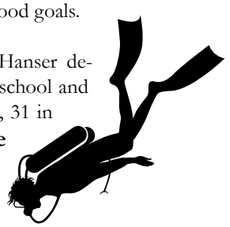
Presenters:
Heather Ketebengang, PCS
Steven Victor, TNC Micronesia
Sahar Hanser, PICRC

Communities in Palau are **highly active in community-led conservation**. This Panel explored the features of community activism. Audience discussion showed that **communities have a big role to play in Climate Change and Adaptation** efforts.

Program Coordinator Heather Ketebengang spoke on behalf of a coalition of **communities and scientists that have been studying and advocating** for the Northern Peleliu *Lkes* (sandflats), which in 2016 gained international recognition as an Important Bird Area (IBA). Palau is in the East-Asian Australasian Flyway, which is the most species-rich pathway for migrating birds *in the world*. 36 of the 54 migratory shorebirds that use the flyway have been recorded in Palau. Sandflats with key coastal wetland features are critical habitats for migrating shorebirds, and the **Northern Peleliu Lkes is the only such habitat in Palau**. With exceptional abundances of 3000 birds from 25 species using the site regularly, this also makes the **Northern Peleliu Lkes the most important migratory shorebird hotspot in Oceania**. Because these shorebirds migrate across the globe, conservation of migrating shorebirds is an internationally-shared responsibility. Protection of Northern Peleliu Lkes meets both local/community desires and national/international commitments. The community is currently working on protecting the site, possibly through PAN.

Fisheries Coordinator Happy Fritz reported on **fishermen-driven efforts to improve fisheries management through creation of a Northern Reefs Fisheries Cooperative**, with members from Kayangel and Ngarchelong. Unlike past government efforts to increase the authority and skills of law enforcement officers, this effort is targeting fishermen. Measures agreed include **controlling access through local permitting, zoning, species restrictions, camera surveillance, and size limits**. These tough limits have been pushed at the State by fishermen themselves, with clear links to long-term livelihood goals.

Communications & Outreach Officer Sahar Hanser described PICRC's Internship Program for high school and college students. There were 9 interns in 2014, 31 in 2015, and 24 in 2016. **Former interns have obtained higher degrees and returned to Palau to work in conservation**.



Disturbance & Threats Panel

Moderator:
Lukes Isechal, PICRC

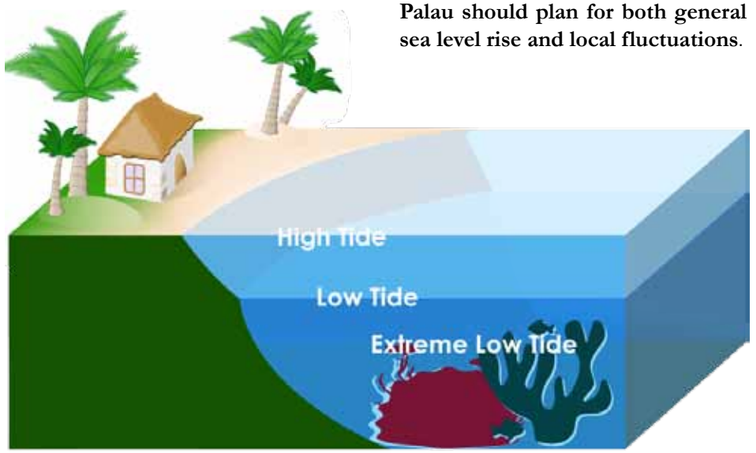
Presenters:
Dr. Pat Colin, Coral Reef Research Foundation (CRRF)
Staci Lewis, Stanford University
Dr. George Roff, University of Queensland
Minelli Olkeriil & David Moses, Mindszenty High School

Ecosystems in Palau are plagued by disturbances and threats from the bottom of the reefs all the way up to the tips of coconut trees. **Knowledge of threats is essential for conservation and recovery**.

CRRF Director and President Dr. Patrick Colin presented an overview of two decades worth of coral reef research and monitoring, including findings that tie impacts from sea level rise and warming temperatures together. Mass coral bleaching in 1998 was the wake-up call that Palau's ideal conditions were in threat from extreme weather events. Findings included:

- Palau's coral reefs experience El Niño and La Niña in different ways.
- During the 2016 drought, shallow areas in the lagoon experienced very cold water. Over two weeks, the water turned from cold to warm.
- Sea Levels fluctuate (in particular due to extreme low tides), but on average have been rising in Palau.
- La Niña increases sea levels; this is tied to flooding in taro patches and high coastal tides.
- La Niña brings coral bleaching, with no temperature refuge (colder water) at depth.

Dr. Colin discussed extreme low tides and the threat they pose to coral survival: **extreme low tides expose corals to warmer temperatures than they are used to, eventually leading to bleaching**. Thus, corals in Palau appear to be less sensitive to temperature changes and more vulnerable to tide levels. Dr. Colin introduced the concept of a **"Death Line": the twin effects of El Niño/La Niña limit the depth of Palau's coral reefs to around 60 meters**. In answering questions from the audience, Dr. Colin noted that fish and invertebrates tend to move, and thus can adapt to changes. Corals cannot move and may instead bleach. **Palau should plan for both general sea level rise and local fluctuations**.

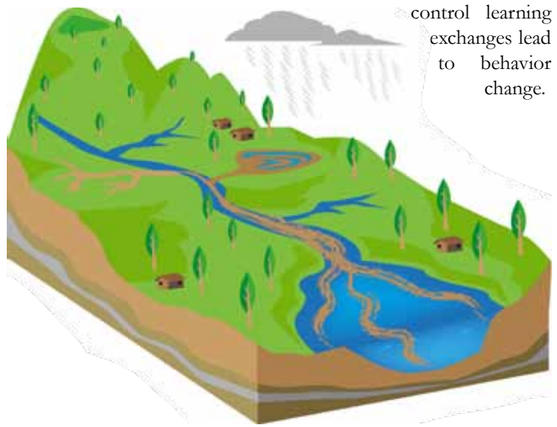


Postdoctoral Research Fellow Dr. George Roff presented on the impacts of extreme weather events on reefs, describing a Phase Shift from red to brown algae on eastern reefs after the December 2012 Typhoon Bopha. Researchers who surveyed reefs pre- and post-typhoon found drastic changes: **Coral cover dropped significantly, with red algae blooms dominating coral areas, inhibiting herbivorous fish from grazing**. In 2013 macroalgal cover was still high, prohibiting coral growth. By 2014 there was observed succession to brown macroalgae which continues to persist. However, **sites with more coral recruits had lower macroalgal cover**, supporting recovery. Tagging of coral recruitment sites indicated that corals are not negatively impacted by macroalgae once they settle, meaning recovery is possible although it takes a long time. In answering questions from the audience, Dr. Roff suggested that making efforts to remove or stop macroalgal growth would help herbivorous fish and thus make reefs more resilient.

PhD Candidate Staci Lewis presented on a sedimentation study of Ngeremeduu Bay. Sediment history for the past 60 years was determined by taking cores of the reef flats near the river mouth versus outside the bay, and then examining barium content. (Sediment introduces the element barium, which corals confuse for calcium; they incorporate the barium into their skeletons, which are usually composed of calcium carbonate). For this study, corals served as a proxy for

Photos: *Top Left:* Taking cores on the reef. *Top Right:* Construction of the Ngeremlengui road with heavy erosion. *Bottom:* Aerial image of Ngeremeduu Bay with sediment plume.

sediment. Cores revealed that sedimentation peaked inside the bay during 2006 and 2007; with a gradual increase in sediment leaving the bay since 2004. Outside the bay there was low sedimentation in 2000 and 2001 and high levels in 2006 and 2007. This indicates that **Ngeremeduu Bay has reached a tipping point in its ability to retain sediment. Current land uses are resulting in heavy sediment loads into Ngeremeduu Bay, and this sediment spreads out on the outer reefs**. This technique, combined with records on earthmoving permits, allows for the ability to understand the impacts of land use change on Babeldaob. Additional research will examine the effectiveness of the 10-year-old Belau Watershed Alliance in facilitating watershed management, as well as whether erosion control learning exchanges lead to behavior change.



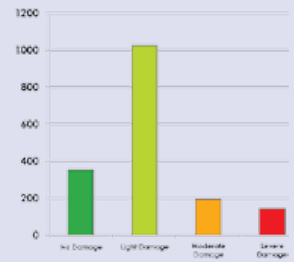
Coconut Rhinoceros Beetles

High School Students Minelli Olkeriil and David Moses presented on the distribution, effects, and biotypes of Coconut Rhinoceros Beetles (CRB, *Chermelalius*), work conducted by a collaboration of four agencies and research/educational institutions. The study mapped CRB throughout Palau (from Kayangel to Merir), and found **damage from CRB in 90% of trees**. Damage was light in most trees, and would not affect coconut yield but would reduce the utility of the leaves for weaving and other traditional uses. There are two biotypes of CRB in Palau: the Pacific type which was introduced to the Pacific in the early 1900s and the Guam biotype which was first observed in 2007. The Guam biotype is much more destructive than the Pacific biotype. Evidence gained by extracting DNA from CRBs and looking for a specific virus suggests that the **two biotypes of beetles may be interbreeding, creating a new, unclear threat from a new biotype**. Efforts to understand and control CRB should occur now, before their negative impacts to trees increases.

Importance of Coconut Trees
- "Tree of Life"
- Integral to Pacific Island culture
- Numerous products (Food, drink, oil, baskets, brooms, mats, home building materials, etc.)
- Important source of income
- Tourist attraction

50 Sites surveyed from Kayangel to Merir

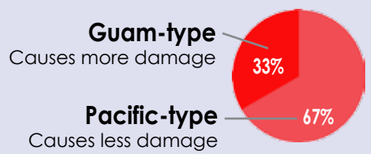
Trees assessed **1500+**



90% Trees with some damage

LIGHT Damage on most trees

200 CRB trapped and DNA tested



Making the Case for Change Panel

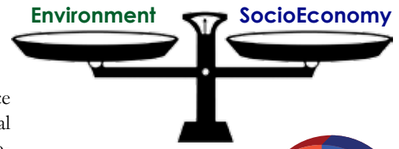
Moderator:
Madelsar Ngiraingas, Palau Conservation Consortium

Presenters:
Ron Leidich, Planet Blue Kayaks
Dr. Ann Kitalong, The Environment, Inc.
Yechad er Edukl *Francis Toribiong, Board Member, PCS*

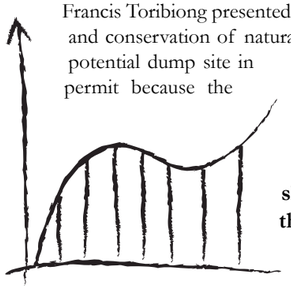
Members of this Panel discussed areas of environmental management that need to change from the status quo. Change requires **explicit inclusion of socioeconomic information**. Above all, change requires **Respect, Patience, and Karma**.

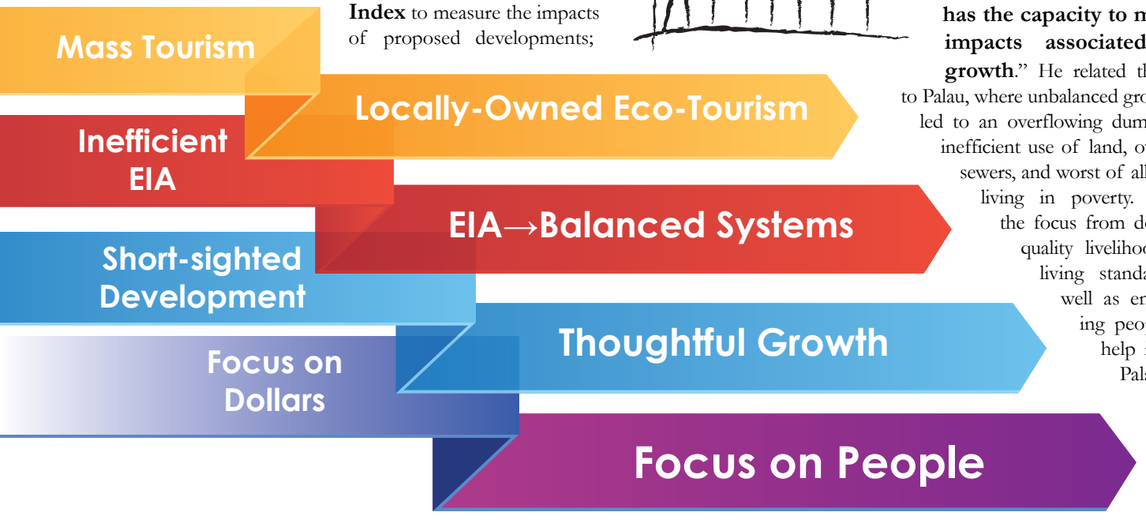
Biologist and eco-tour Founder Ron Leidich presented a case for **shifting Palau's tourism model from mass marketing to eco-tourism**. He stressed that eco-tour operations should be locally owned and operated, and compared it to the current situation: 176 tourism companies and hotels operate in Palau, and most are foreign-owned. Local ownership, however, makes the natural environment a resource that is a direct asset to the company; and thus worth conserving. The mass tourism model so far has led to environmental damage (pollution, damage to reefs, illegal shark fishing, overfishing, traffic, sewage problems, among others). Leidich presented statistics showing that 1) foreign-owned companies keep the majority of income from tours to Palau in their own countries (it does not come to Palau); 2) private-sector jobs for Palauans have fallen in the past decade, despite increasing number of tourists; and 3) that the adjusted gross wage index for Palauans has fallen by over $1800 per year. Leidich advocated for use of a **Benefit Index** to measure the impacts of proposed developments; saying that **only tour operations that benefit communities, the local population, and Palau environmentally and socioeconomically should be licensed**.

Project Manager Dr. Ann Kitalong presented the results of a survey showing that the **Environmental Impact Assessment (EIA) process in Palau needs improvement**. She described the EIA as a tool to assess proposed development projects; ideally to find a balance between ecological impacts and socioeconomic impacts. The 2011 survey consisted of Structured Interviews with 26 key informants. 31% of respondents said the EIA was an effective tool for identifying effective mitigation and enforcing permit conditions, collecting baseline data and acting as a reference, and planning and evaluation. **69% said the EIA process needs improvement:** a more clearly defined and simplified/streamlined process, authority for States, better use of scientific information, and consequences for violations (including benefit-sharing). Changes needed include increased support for implementing agencies like EQPB (improved budgets, training, authority, awareness, and acceptance/adherence), improved partnerships, decentralization of responsibilities, and a mechanism to address cumulative impacts.



Chief, Board Member and Community Advocate *Yechad er Eldukl* Francis Toribiong presented a local perspective on balancing use and conservation of natural resources. He described visiting a potential dump site in Oregon (USA) that was denied a permit because the planning for the site was short-sighted and had no enabling mechanisms for growth. *Yechad er Eldukl* said: "**Development should only be approved if the country can demonstrate it has the capacity to manage impacts associated with growth**." He related the story to Palau, where unbalanced growth has led to an overflowing dump, litter, inefficient use of land, overtaxed sewers, and worst of all, people living in poverty. Moving the focus from dollars to quality livelihoods and living standards, as well as empowering people, will help improve Palau.





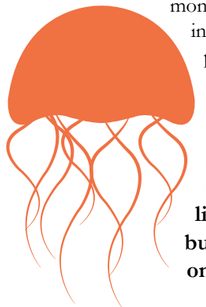
Climate Change Panel: Impacts & Community-Based Adaptation Strategies

Moderator:
Charlene Mersai, NEPC Secretariat

Presenters:
Gerda Ucharm, CRRF
Carol Emaurois, U. of South Pacific –European Union– Global Climate Change Alliance Project
Kevin Mesebeluu, Ngardok Nature Reserve, Melekeok State

Climate Change may be a global issue, but its impacts are felt most at the local level. This panel explored how impacts–and solutions–vary in different places in Palau. As the Moderator summarized: "**Information leads to Action**."

Research Biologist Gerda Ucharm presented data from ecological monitoring of Jellyfish Lake, *Ongeim el Tketau*. The **2015 El Niño–including the drought and change in the normal energy structure–influenced the lake's water temperature and salinity.** In November 2015 the jellyfish population began a downward trend from a monthly average of 5 million jellyfish to 3 million jellyfish. March 2016 data showed the start of the decline of adult jellyfish; by June 2016 there were zero jellyfish. A CRRF research partnership examined the cause of the population crash. Early results show a correlation between rainfall and nutrient availability. Palau experienced its lowest annual rainfall ever recorded in 2015; the normal energy cycle of the lake was affected by the drought. The lake also went from being limited by availability of Phosphorus to being limited by availability of Nitrogen. At the time of the presentation (August 2016), conditions in the lake were reaching normal levels and a healthy population of polyps had been observed. Continued monitoring is necessary in order to track and predict the population. In response to audience questions, Ucharm stressed that the **jellyfish decline was not linked to tourism but was dependent on weather**.



In-Country Coordinator Carol Emaurois gave an overview of the Global Climate Change Alliance Program. Community assessments of 259 people in 13 States found:

- **96% of people were Concerned (at least some) about Climate Change.**
- Communities feel that Climate Change reduces taro, fruit, and plant production
- Solutions will vary and communities need adaptation options.

Tested adaptations included improving agricultural productivity plus trialing of livestock management (chicken and pigs) as alternate protein sources. Water security activities included installation of water tanks in Ngaraard and Kayangel. Storm shutters were installed in Ngardmau. The same Community Assessments found that **communities struggle most with finding solutions for governance and socioeconomic** problems.

Program Manager Kevin Mesebeluu presented on ongoing efforts to predict and understand the impacts of Climate Change in low-elevation Melekeok. To document what is currently known, Melekeok created a participatory 3-D model of the state, identified ecosystem services of Ngardok Lake, conducted short-, mid-, and long-term Cost-Benefit Analyses of different adaptation options, and drafted a Melekeok Conservation Network Management Plan that covers ridge to reef and which explicitly considers Climate Change. Mesebeluu stressed that knowledge and **planning increase resilience; for instance during the 2016 drought, Melekeok applied its management plan and did not have to go on water hours.** Future goals and activities will focus on water security through re-vegetation and guidance for development on varying soil types; use of natural defenses to limit shoreline erosion; creation of a new MPA to protect long-range habitats for fish; and adoption of climate resilient building codes. Melekeok has found success because Traditional Leaders, Elected Leaders, and the Community have worked together; and because the state has thought big picture with a Master Plan.

Photo: 12' x 10.5' 3D model of Melekeok.

Day 1 Key Points

Much research and conservation/natural resource management work is being done in Palau by local researchers and practitioners as well as by researchers from abroad. What they are finding is exciting, astounding, and useful. Equally amazing is the number of young Palauan researchers and practitioners who are involved.

What they are finding is exciting, astounding, and useful. Equally amazing is the number of young Palauan researchers and practitioners involved.

Declining fisheries is a pressing issue and our communities and fishermen are vocal advocates in their desire for Palau to craft a local solution to this issue. Part of this solution requires understanding the parameters of the problem and as such there is a lot of effort by local researchers, visiting researchers, and practitioners who are using sophisticated tools to conduct fisheries research. Their main purpose is to collect information that we need to make good recommendations for management of fisheries. The Northern Reef Fisheries project and the work on pelagic tuna fisheries are good examples of this.

There is a strong movement to ensure that **both scientific and traditional knowledge** on ecology and resource management are used to inform management decisions. This trajectory is most effective when there are institutions/organizations engaged in partnerships to ensure that knowledge reaches targeted audiences who then become empowered to act. The Palau Small Grants Programme and education and outreach programs by PICRC and others are examples of this.

Many presentations demonstrated that our **environment underpins the health, economic, and social well-being** of Palauans. Environmental issues and the environment sector cannot be separated from other sectors. A holistic approach is needed to address the issues that Palauans face today. Equally important is the conviction that addressing these issues is our collective responsibility and we cannot shy away from it. As one presenter so eloquently put it: "Our success or failure rests in our hands."

"Our success or failure rests in our hands."

Our **communities have a really big role to play,** particularly with respect to Climate Change and Adaptation efforts. However, they need relevant information to guide their actions, and they need the environment sector to support their efforts.

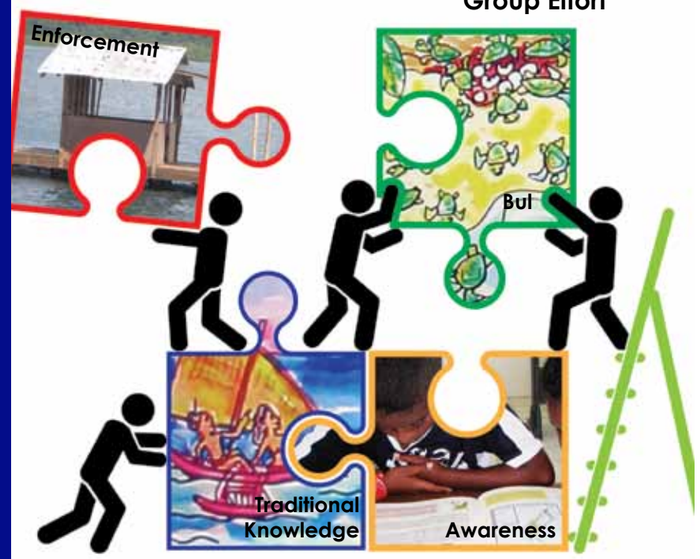
"As the world is in constant change, so is our environment. While it may be difficult for us to control much of this change, we have managed to learn to benefit from our environment, and therefore, we must also do our part to protect it."

Opening Remarks

Beouch Kyoshi Rechucher
Rubekul Belau

Beouch reminded us that change in the natural environment is constant, as are the manmade changes we make. He said, "We cannot control change but we can learn to use it." However, it is "the manmade environment that is the problem." Beouch recognized many of the ongoing efforts to live within this changing environment, such as States establishing Protected Areas, Ngarchelong's management efforts based on traditional authority, and the National Marine Sanctuary.

Group Effort



Individual Responsibility

Beouch advocated for three actions to help protect our environment: **Personal responsibility, Group effort, and Employing traditional knowledge**. Every person should be asking, "What can I do?" because each person has a different role to play and we each need to do our part. He also reminded us that Palauans still have our customs and traditions regarding conservation of resources–*Bul*–that have worked for us in the past and continue to work for us today, especially when addressing the problem of enforcement. Beouch ended his remarks by stating that the Council of Chiefs, as the traditional stewards of Palau's environment, are inherently a part of the environment sector and are ready to work within our respective communities for the benefit of all.

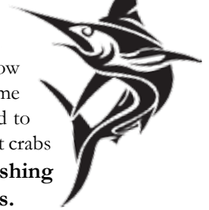
Special Presentation: *Working With, Not Against, Coral Reef Fisheries*

Dr. Charles Birkeland
University of Hawaii

Dr. Birkeland acknowledged that Palauans are good fishermen who know the marine environment better than scientists. But he also stressed that it is the perspectives of fishermen and scientists that differ (not goals). The challenge lies in making science and traditional knowledge work together.

Dr. Birkeland explained the ecology of a self-correcting reef, which means that its parts are in balance. For instance, fish populations will increase with the more offspring they have; however the populations are limited by space available. Thus a balance is maintained and fish populations are stable. Coral reefs are very productive, but because they are already in balance they do not have much excess production. Taking resources without thought can upset this balance. Presentations from Day 1 showed that Palau's inshore fisheries production is currently very low. Thus it is not surprising that more and more effort is needed to find fish.

A 12.5 kilogram fish can produce up to 233 kilograms of fish in its life. So taking a big fish drastically reduces the potential to reproduce. Other fish have a role in keeping the reef healthy. Parrotfish and other herbivores eat algae on corals; removing them reduces reef health. Taking too many of any one kind of fish can upset the careful balance.



Pelagic fish (like tuna) grow rapidly and have short lives, making them a more sustainable choice. This is very different from reef fish, which grow very slowly. Reef fish need to live for a long time before they mature and reproduce; and they need to reproduce many times to replenish a reef. Coconut crabs also take nine (9) years to mature. **Sustainable fishing acknowledges these balances and systems.**

Dr. Birkeland offered ways to keep balance:

- Exporting coral reef fish does not make economic sense because the fish take so long to grow.
- Feed tourists more pelagic fish instead of slow-growing reef fish and coconut crabs.
- Big fish are using Protected Areas, so continue to maintain and enforce MPAs.
- Discourage harvest of herbivores during recovery and use science to determine a harvestable level.
- Harvest slow-growing species only for local, special occasions.
- Putting a cap on overall demand (e.g. capping tourist numbers) will reduce demand on fisheries.

Day 2 Plenary

Special Remarks: *Gathered Here with a Common Goal*

His Excellency Tommy E. Remengesau
President of the Republic of Palau

President Remengesau began by referencing a traditional proverb, "*Kid el rokui a kmal di ua omerollel a meseknuk el ta uldsued e ngar tiang*," loosely translated as: "Like the surgeonfish, we are all here with one purpose." This common goal was to reaffirm the importance of the environment, reflect on the work already done, and attend to the needs of the future.

The President stressed that while everyone has an idea for Palau's journey forward, the national constitution provides an answer that we must all heed: "*Ke de melissich e mengedmokl e omakes el bedul uchei loiak a Rubak el Dios*." Meaning, we are rich in our natural environment and our traditions, so we must strengthen those as we go on. We must defend and protect what we have from our past: our culture and our environment. The President said this means we need Sustainable Development, accomplished through a shared journey.

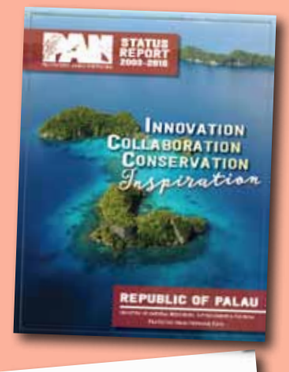
Science can tell us about our traditions, and where they need to be strengthened. It tells us that our current fishing practices are not sustainable. Both science and tradition have a role to play, he said, and illustrated with the following: "*Give man a fish and you have fed him for a day. But teach a man to fish and you have fed him for a life time.* This is our Palauan proverb and it works. However, what do you do when you know how to fish but there are no more fish in the ocean? It is not enough to teach a man how to fish, we must ensure that there are fish to catch."

National Launching

Moderator:
Honorable Elbuchel Sadang, Ministry of Finance

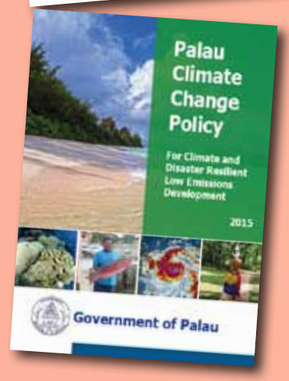
Presenters:
King Sam, Protected Areas Network, MNRET
Gwen Sisior, MNRET
Erbai Matsutaro, Ministry of Finance

Minister Sadang reflected that Palau has achieved certain milestones in its environmental efforts, and these are well documented and accessible. These documents are both a resource for guiding our future actions and are a testament to our ability to work together to craft shared goals. These documents will help us conserve and manage both environmental and financial resources so that they continue to provide benefits for the people who depend on them.



PAN Manager King Sam launched the **Protected Areas Network (PAN) Status Report 2003-2015**. The report describes the PAN's clear evaluation process to determine how well natural resource assets are being managed. Notable findings included: 1) an overview of financing, showing that over $7 million had been distributed to sites and management efforts; 2) 57% of funds were distributed directly to states; 3) 41% of Palau's nearshore marine area is in PAN.

Project Manager Gwen Sisior launched **Palau's National Biodiversity Strategies and Action Plan (NBSAP): Promoting wise development to achieve conservation and sustainable use of biodiversity 2016-2026**. The NBSAP lays out goals and a roadmap for wise use of resources in 7 strategic areas: 1) Protected/Managed areas; 2) Species protection; 3) Biosecurity/Invasive species & Bio-safety; 4) Integrating biodiversity and ecosystem services into development policies; 5) Reducing direct pressures on biodiversity through sustainable use; 6) Ensuring Food Security through maintenance of agricultural biodiversity; and 7) Mainstreaming conservation. The NBSAP is a cross-sector plan that involves the government, private sector, and communities.



Climate Change Coordinator Erbai Matsutaro launched the **Palau Climate Change Policy for Climate and Disaster Resilient Low Emissions Development**. This is Palau's first policy that provides actions to both mitigate and adapt to climate impacts.

The launching event generated a lively discussion with many ideas for sustainable development being put forward:

1. Policies or tax breaks to encourage purchase of **hybrid cars**.
2. **Closing off a portion of the main street** to cars and making it solely for pedestrian use. Using back streets for cars.
3. **Redesigning roads** in Koror to make them more user-friendly, especially to pedestrians. For Palau to be a high-end destination, visitors need to be able to walk around.
4. Outside of Koror, States need **rethinking on ways to charge and collect citation fees.** They do not have full-time Legal Counsel or mechanisms to collect citation fines. Mechanisms to share national resources (e.g. Attorney General's resources) with States could help.

Sustainable Fisheries for Food Security Panel

Moderator:
Steven Victor, TNC Micronesia

Presenters:
Bridget Adachi, Northern Reefs Fisheries Cooperative
Leon Remengesau, Bureau of Marine Resources, MNRET
Asterio Takasi, Tuna Project, MNRET

This panel focused on fisheries management as a strategy for ensuring Food Security. **Fisheries management is therefore about sustainable use**.

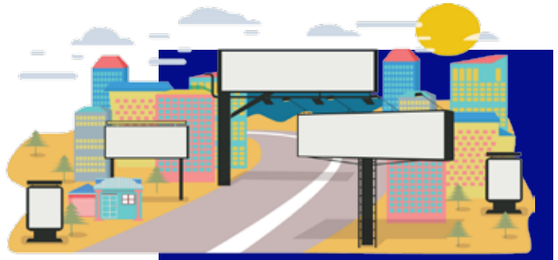
Director Bridget Adachi described the Northern Reef Fisheries Co-operative (or Co-op) as a community-based effort to manage fisheries. The effort involves two states (Kayangel and Ngarchelong), as well as varied government and nongovernment partners. The **Co-op explicitly links fishermen to markets, with agreed rules of engagement and benefits.** Fishermen jointly make decisions in the co-op. Challenges to the Co-op's full operation include inadequate funding, equipment, tools, knowledge, and skills; plus difficulty getting all fishermen on board with all new decisions and rules. More community awareness and support, plus expanded opportunities for learning exchanges, would be helpful.

Acting Director Leon Remengesau discussed efforts to reduce pressures on reef fish by instead developing aquaculture. Palau has well-developed capacity to culture giant clams and milkfish; challenges remain in making them both productive and profitable, especially in light of Climate Change. The Government is working towards having a self-sustaining hatchery that can demonstrate viable aquaculture techniques for small-scale farmers of business. **Aquaculture holds enormous potential for Food Security** in Palau.

Manager Asterio Takesi discussed national efforts to **alleviate overfishing of coastal reef fisheries by shifting consumption to offshore fish via the Palau National Marine Sanctuary** (PNMS). Since 1979 the vast majority of offshore fish (mostly tuna) have been exported, with little consumed locally. Longline fisheries target high-value Bigeye and Yellowfin Tuna. The PNMS domesticates the fishing industry, so that tuna fishing boats will be based in Palau. Fish caught in the 20% of Palau's EEZ that has been designated the Domestic Fishing Zone will be banned for export and must be retained in Palau. No fishing will be allowed in the remaining 80% (the sanctuary). Studies are currently underway to provide information on what sustainable catches and size limits should be for fish caught in the Domestic Fishing Zone. Other studies will determine techniques to ensure sustainable fishing throughout the industry (e.g. to reduce bycatch).

With assistance from Japan, Palau is renovating the Mariculture Demonstration Center. It will include a 536 square meter Main Building, Sheds totaling 1,840 square meters, elevated Water Tanks Building, Machinery House, Pump House, and Exterior works.

Laying the Groundwork for Smart Growth Panel



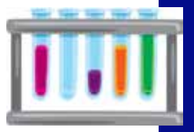
Moderator:
Roxanne Y. Blesam, EQPB

Presenters:
Anthony Rudimch, Koror-Airai Sanitation Project
Metiek Kimie Ngichechol, EQPB
Brian Melairei, Bureau of Public Works, MPIIC

Palau has seen **drastic urban development, with growth outpacing the underlying foundation**. Koror has been plagued with overflowing sewer and solid waste systems and declining water quality. Solving these problems requires **modernization, technical advancements, and a change in practice and thinking**.

Project Manager Anthony Rudimch presented on Koror-Airai Sanitation Project (KASP), a $30-million dollar loan-funded project to **overhaul Koror's sewer system** through: 1) improved sewage collection in Koror and Airai; 2) sewage treatment and disposal to meet environmental standards; 3) provision of safe and hygienic public toilet facilities (with six already identified in Koror); and 4) effective project management (to include capacity building, training, and knowledge transfer). The project uses estimated population and tourist growth to 2036. Larger pipes will run along the main road, thus enabling faster repairs. The current treatment plant will be decommissioned and turned into a park; a new plant will be built in the vicinity of the Koror Animal Shelter (on higher grounds to enable a gravity system). The Airai sewer system will be a stand-alone system. Designers are considering a small river in Kesebelau for the output.

Lab Supervisor Metiek Kimie Ngirchechol described Palau's water quality standards and regulations. Palau has a high-quality laboratory capable of testing marine waters and freshwater for pollution. Poor development can introduce pollutants (chemicals and particles) that harm reefs, drinking water, and habitats. Investors interested in developing here need to accept **Palau's stringent water quality rules**. All water in and around Palau has a certain classification based on existing and allowable water quality; the classification dictates zones, allowable uses, and impacts. However, development projects, individual actions, and insufficient zoning have contributed to pollution. Ngirchechol also cautioned against expanding aquaculture without thinking of broader impacts–current practices often release too many nutrients onto reefs.



Director Brian Melairei showed a video about Palau's Solid Waste Management improvement efforts, including rehabilitating the Koror landfill using the Fukuoka Method for separation. The site has **recycling centers, a redemption center for aluminum and plastic beverage containers, and facilities to compost food waste**. Palau's recycling redemption program has been recognized as one of the best in the region. With these measures, the Koror landfill should last until 2020, although typhoons and storms have reduced its life expectancy. Work on building a modern Solid Waste Management site in Aimeliik is underway, starting with an Environmental Impact Assessment and Conceptual Design.

This panel generated many questions (including via the radio call-in line) and underscored concerns:

1. The successful provision of **public toilet facilities (currently at Long Island, Meyuns Sea Plane Ramp, and Bethlehem Park) requires public awareness and support**. There is an education and communications strategy being implemented, but it needs more outreach.
2. How the public uses the new sewer system will determine its longevity and functionality. For instance, **disposing of used oil in the sewer system will cause it to malfunction**. Public compliance is essential.
3. The new sewer system is designed to ensure that waste moves within a 3-hour window, plus it has aeration, to **reduce bad odors**.
4. The system will be a hybrid system with ponding and a pump station to manage sludge. **Sludge will be dried and tested before being disposed** of as solid waste.
5. Monitoring of **liquid effluent will reduce algae blooms** at the disbursement site.
6. **EQPB will conduct nutrient testing of the sewer system**. New materials were purchased through the KASP project, but **long-term needs will need to be addressed**.
7. EQPB's authority and responsibility is to ensure that all parties (including national and state governments) are in **compliance with water quality regulations**. Enforcing compliance by collecting fines remains a challenge. EQPB's goal is not to increase citations and fines, but to **increase proper management**.

Profitable & Sustainable Tourism for Everyone Panel

Moderator:
Umai Basilius, PCS

Presenters:
Bouveau Anastacio, Bureau of Tourism, MNRET
Kevin Mesebeluu, Ngardok Nature Reserve, Melekeok State

Tourism is Palau's largest industry. In 2015 tourism generated $160 million dollars. However, recent rapid growth of tourism has outpaced social, economic, cultural, infrastructure, and environmental capacity. A major cross-sector goal is to **manage tourism so that it provides benefits to Palauans while maintaining Palau's natural environment, human resources, and culture**. Solutions are being **driven by cross-sector forces**, from government to nongovernment, private businesses to communities.

Director Bouveau Anastacio presented on national level efforts to develop and implement a **Responsible Tourism Policy Framework to guide growth and actions in the tourism industry**. The Policy Framework guides the implementation of institutions, practices, and mechanisms to protect Palau's tourism brand of "Pristine Paradise Palau" and deliver benefits directly to the Palauan people. The Framework has six components:

1. Certification standards and ratings
2. Palau product authentication
3. Outreach & communications
4. Airport Exit Survey
5. Tourism database
6. Regulatory framework

Pristine Paradise. PALAU
Palau Visitors Authority

The Policy Framework was in review in late 2016, and represented one part of a multi-phase effort. An upcoming phase would include training at the state level on the framework and its regulations.

Program Manager Kevin Mesebeluu described Melekeok's response to an overwhelming influx of tourists in early 2015, many with intrusive behaviors. Melekeok held a tourism symposium in July 2015 to identify problems and solutions. After a self-assessment, the state determined that the **state had not provided tour companies with enough guidance** on available tourism products and acceptable visitor behaviors. This finding led to a systematic effort to raise awareness via a **Responsible Tourism Campaign, coupled with identification and development of tourist products that respected and integrated the community's traditional knowledge and practices**. Tourism products include guided visits to a *Mesei* (taro patch) and related souvenirs; opportunities to engage in *Beng* (a traditional type of sustainable fishing method practiced in Melekeok and Ngeremlengui); and promotion of "Melekeok City–Capitol of the Past and Present." The Responsible Tourism Campaign relies on partnerships (state governments, NGOs, PVA, and national government).

A lively discussion explored resources available to support sustainable tourism.

1. There is assistance to help communities and individuals plan for eco-tours, but there are also gaps. PVA's mandate includes assisting with developing new tourism products and sites, but in practice their capacity is in marketing and promotion. The Bureau of Tourism is policy-oriented. So **there is a gap in providing assistance to grow new tourism products**.
2. NGOs provide some assistance in setting up tourism products but are limited in capacity (financial and personnel). The Sasakawa Foundation is setting up a **pilot eco-tour in Ngaraard to act as a demonstration site**.
3. States need financing in order to market their tourism products; yet many feel that visitors to Palau are already overburdened with small fees at every site and for every activity. **High-value tourists do not like paying small fees at every stop;** visitors assume that Koror's Rock Island fee is shared. *Palau needs innovation!* One idea comes from Norway, where visitors are issued a "credit card" which they use to access multiple sites.
4. **Facilities (e.g. public toilets) are lacking or of poor quality in many places, and thus tourists are hesitant to spend money on fees when they cannot see any positive investment**. To become a high-end destination, Palau must improve services.
5. The Bureau of Tourism also must consider the **health of visitors** to Palau.
6. **EQPB has rules to review development projects**, but these need strengthening.

Leadership Responses

Response from the Governor's Association

Honorable Yoshitaka Adachi
Governor of the State of Koror

Governor Adachi stressed first that the successes, results, and solutions presented during the Symposium were the accumulation of an ongoing effort, started by the people who built the foundation.

"The knowledge and contributions of our elders and pioneers continues to be important and needed, and as such we should not forget about these FOUNDATION BUILDERS in our ongoing efforts."

Koror State may have been "lucky" to have the Rock Islands, but this blessing came with responsibilities. Taking care of (and benefitting from) our natural environment requires a lot of hard work and investment. As Adachi said: "We did not come here from nothing. We worked hard to be where we are today."

Adachi pointed out that even with the many opportunities and responsibilities to integrate new ideas, policies, and initiatives, States are still responsible for fulfilling their basic duties and providing regular services, like infrastructure. The Governor described Koror's sewer system problems as an example of an infrastructure problem plaguing states. He then offered a simple but essential solution: Instead of trying to hide the problem, he said, "let's reveal it and let's all try to do something about it." This is how you provide an enabling environment for change.

Response from the House of Delegates, 9th Olbiil Era Kelulau

Honorable Lentser Basilius
Delegate from the State of Melekeok

Delegate Basilius presented short remarks, and invited participants to read the full Position Paper prepared by the House of Delegates (*See Appendix 4*). He stated that the House of Delegates agrees with the top three threats and their primary causes, as identified at the Symposium:

1. Declining Food Security from Overfishing.
2. Pollution from Infrastructure Development.
3. Negative environmental impacts from Tourism.

He stated that these are the "foremost environmental concerns in shaping Palau's national policy today, in the near future, and for generations to come." The House of Delegates supports the expansion of fisheries options, including exploration of appropriate aquaculture and offshore fishing options, including moving beyond traditional fishing methods and fishing grounds.

Informal Response from the Senate, 9th Olbiil Era Kelulau

Honorable Jerrlyn Uduch Sengebau Senior
Senator

Senator Senior offered her personal reactions to the Symposium in three key areas:

1. Numerous presenters have shown that it is possible and useful to merge tradition with modern science. In fact the Constitution calls for it by allowing States to own natural resources. The Symposium offered numerous pathways for moving forward in harmony with the past, present, and future.
2. The Senate has resources to help with environmental protection. For instance, the Senate's Judiciary and Governmental Affairs (JCA) Committee can assist with improvements to compliance and enforcement.
3. "Conservation is alive and kicking!"

Next Steps

Information from the Symposium will be shared widely, and used by the National Government, States, communities, businesses, and individuals to improve conservation. Priorities identified during the Symposium will inform National Government and NGO work plans.

Professor Bob Richmond

"Think of using science to inform policy like SPAM MUSUBI. Science is the rice–it's the many grains of facts and traditional knowledge. It's a mixture of science and traditional knowledge. Spam represents political will and people. Like Spam, a mystery meat, with people and political will you don't quite know what it is–it is the Human Element that brings together knowledge and action. When you add it together, you can bring together sound policy and action."

Photos: Symposium participants (not already pictured elsewhere).

Appendices

Abstracts Appendix 1

Day 1

Presentations on Day 1 were structured around submitted abstracts; topics for abstracts were invited based on the pre-symposium survey results. Speakers and topics for Day 2 were invited based on survey results and in order to find solutions for problems identified in abstracts.

Panel 1: Fisheries

Fishery-dependent data collection in Palau: Identifying fishery targets at risk of over-exploitation

A.L. Isechal, Palau International Coral Reef Center (PICRC)
S. Linfield, Coral Reef Research Foundation. Formerly of PICRC
P.D. Omelau, University of Alaska—Fairbanks. Intern, PICRC
U. Olsudong, PICRC

As in many Pacific Island countries, coastal fisheries provide an important source of food, livelihood and cultural identity to the people of Palau. The per capita consumption of fresh fish in Koror has been estimated to be 77 kg person-1 year-1, significantly higher than the regional average of 35 kg person-1 year-1 (Friedman et al. 2009). This strong local demand is coupled to exponential tourism growth and the associated restaurant industry to create a substantial market for reef fish. Since at least the mid-1970s, fishers have expressed their concern for declining fish stocks (Johannes 1981; Kitalong and Dalzell 1994). Despite this growing demand and the persistent concern of fishers regarding the health of fish stocks, there is no established fishery-dependent data collection system to inform fisheries management. We collected data of fishermen landings at Ollei Port in Ngarchelong and at JR5 Fish Market in Koror, using a novel approach of 3D video footage and stereo-video footage analysis. Using size distribution of the main fishery targets and species-specific size of maturity (SOM), we identified fish species that are potentially being over-exploited. We also used a survey questionnaire to collect data of the fishing trips and calculate catch per unit effort. Purchase invoices from the fish market were used to estimate annual tonnage of fish landed. Finally we make recommendations for fishery-dependent data collection in the future.

Baseline Assessment on Fishery Stocks of the Northern Reefs of Palau

Dawnette Olsudong, Steve Linfield, Marine Gouezo, Asap Bukurrou, PICRC

The northern reefs of Palau contribute to a substantial total area of reef and lagoon habitat in the Republic of Palau. Although this region is often regarded as some of the best areas for fishing, partly due to the distance from the most populated area in Palau around Koror, there is concern and consensus that fish stocks are declining. Here we present the results of a 2015 baseline assessment of fish stocks in the northern reefs. We surveyed fish stocks through a fishery-independent survey using a diver operated stereo-video system. A total of 190 sites were surveyed representing the variety of habitats that occur in the northern reefs. Underwater surveys were done from January to April 2015 and captured a total of 13,853 targeted reef fish, representing 89 species from 15 families. We examined the size-distribution of common fishery targets, the spatial distribution of biomass, and compare biomass in the main habitats in fished and non-fished areas. The size structure of important fishery species suggests that populations have been truncated over time, with fish generally smaller in fished areas compared to protected areas. The greatest fish biomass was recorded on the outer reef slopes.

The science behind minimum size limits as a fisheries management tool: a case study from the Northern Reefs.

Steven Lindfield, Coral Reef Research Foundation
Jeremy Prince, Biospherics
Steven Victor, The Nature Conservancy Micronesia

As fishing pressure has led to declines in coral reef fish stocks, it has become evident that new management approaches are needed to ensure the sustainability of these fisheries. We present a case study from the northern reefs of Palau, where two states have decided to co-manage their fishery resources to safeguard their livelihoods, food security and fishing culture. Previous analysis of the main fishery targeted species showed that spawning potential ratios (SPRs) were below the 20% threshold that allows stocks to recover. Here we describe the science behind setting minimum size limits, a fisheries management approach that can help fish stocks to recover without limiting fishing effort. Firstly, the size of maturity needs to be determined and can be done using a combination of techniques such as gonad analysis, catch selectivity and by filming spawning aggregations with stereo-video. Research suggests that fish size at SPR 20% is around 1.1 times the size of maturity. Therefore using that value as a minimum size will ensure there are enough reproductively active fish to replenish the population. To date, twelve species of fish have accurate size of maturity estimates for which size limits can be grouped into four 'basket' sizes size limits of 10, 13, 16, 18 inches. Other species can be added to these groups based on the best available evidence. This case study documents an achievable approach to coral reef fisheries assessment and management that can be applied to other regions.

Scaling marine spatial protection to reproductive movements of the aggregation spawning grouper Tiau (*Plectropomus areolatus*)

Mark A. Priest, Marine Spatial Ecology Lab, University of Queensland
Alyssa L. Marshell, Marine Spatial Ecology Lab, University of Queensland,
Yimnang Golbuu, Palau International Coral Reef Center
Michael L. Berumen, King Abdullah University of Science and Technology
Jennifer L. McIlwain, Department of Environment and Agriculture, Curtin University
Peter J. Mumby, Marine Spatial Ecology Lab, University of Queensland

Marine protected areas are one of the most commonly used management tools on coral reefs, affording a safe haven for marine species to grow and reproduce away from the threat of exploitation. In Palau, a network of protected areas has been

established to conserve marine resources. Yet, species that possess large home-ranges or undertake regular spawning migrations may move beyond the boundaries of protection, making them vulnerable to exploitation. Here, we acoustically tagged 40 individual Tiau (*Plectropomus areolatus*) at a spawning aggregation located within the Ebiil Conservation Area, and tracked fish movements over one year (August 2015—July 2016) using an array of 28 acoustic receivers. Our results suggest year-round visitation of the spawning aggregation site, differences in residence times between sexes, and movements beyond the boundaries of the current conservation area. Spawning migrations followed predictable routes along reef edges and reveal an asymmetric catchment area for the Ebiil aggregation. The data presented here suggest that marine protected area design needs account location specific movement patterns to effectively protect reproductive migrating grouper populations.

Palau Tuna Project – Research Fishing

Yvonne Ueda, TNC

The Nature Conservancy purchased a year's worth of fishing rights (400 vessel days) in Palau's longline tuna fishery to test new, innovative fishing practices to reduce the bycatch of sensitive marine species like turtles, sharks and rays. The new methods include using different bait, hooks, time of day and depth of gear when setting the fishing line. Bycatch is a huge problem in the longline tuna fishery, where approximately 5 million baited hooks get set each day on 100,000 miles of line. Finding a better way to fish that reduces the risk to sensitive species without sacrificing the economic viability of this fishery can cause a positive ripple effect in longline fisheries around the world.

The Conservancy chartered a longline vessel and crew managed by Luen Thai Fishing Venture, a leading fishing and seafood company, to test these innovative fishing practices out on the ocean. Our scientists are also tagging unintentionally caught blue and silky sharks, which make up the majority of bycatch in Palau's longline fishery, to better understand their survival rates after being hooked and released. These research fishing trials and the shark tagging study got underway in late January 2016. The Conservancy will be working with the government of Palau to use the best practices developed from these research fishing trials to set new, environmental conservation standards for fleets fishing in their waters – and help ensure future fishing in Palau is compatible with the newly created Palau National Marine Sanctuary.

The Conservancy is also piloting electronic monitoring and reporting (EMR) systems in the region and included are 6 vessels in Palau. The information gathered through this pilot will be used to develop recommendations for Palau observer program as well WCPO countries on an electronic monitoring standard for the longline fishery that can be integrated into fisheries management efforts in partnership with governments and industry.

Panel 2: Partnerships: Community, State and National Programs

Ecological conditions of coral-reef and seagrass marine protected areas in Palau

Victor Nestor, Marine Gouezo, Shirley Koshiba, Evelyn I. Otto, Dawenette Olsudong, Geory Mereb, Randa Jonathan, PICRC

Marine protected areas (MPAs) have been widely used as an effective conservation tool against anthropogenic threats. In 2003, the government of Palau established the Protected Areas Network (PAN) to effectively protect and sustain marine resources. In addition, as part of the Micronesia Challenge, Palau committed to effectively protected 30% of its marine habitat by 2020. Despite these great advances in protective management, since 2006, very few data have been collected on the baseline condition of MPAs. The main objectives of this study are (1) to show the baseline ecological conditions of coral-reef and seagrass MPAs in Palau, (2) to investigate the drivers of ecological conditions and (3) to recommend adapted management actions to improve the existing marine protective management. Our results demonstrated that 14% of coral reef and seagrass ecosystems areas were protected; 11.2% of which were under PAN legislation. The marine habitats the most protected were channel and outer reef (>25%) and the least protected were reef flat and lagoon (<10%). Fringing and barrier reef MPAs had relatively good ecological conditions that were mainly driven by the length of protection, the size of the MPAs and the remoteness of the MPAs. Inner reef MPAs displayed good ecological condition as opposite to nearshore seagrass beds MPAs, where more than half had a score lower than 50%. For both inner reef and nearshore MPAs, ecological conditions were driven by pollution caused by poor-land use. To increase the effectiveness of the marine PAN, we recommend that better land use practices that would minimize land erosion and sedimentation nearby MPAs should be implemented as soon as possible with a focus on location with the lowest scores. If new MPAs were to be implemented, they should be in the lagoon and reef flat habitats, as far as possible from the land and river discharges.

Palau GEF Small Grants Program (GEF SGP): Results and Impacts of Palau's Communities to Their Environment

Kiblas Soaladoah, GEF SGP

Launched in 1992, SGP supports activities of nongovernmental and community-based organizations in developing countries. Funded by the Global Environment Facility (GEF) as a corporate programme, SGP is implemented by the United Nations Development Programme (UNDP) on behalf of the GEF partnership, and is executed by the United Nations Office for Project Services (UNOPS).

The Palau GEF SGP opened its doors in 2005 and operated as part of the Micronesia Sub Regional Programme (MSRP) together with the Republic of the Marshall Islands (RMI) and the Federated States of Micronesia (FSM) until 2010. At the start of 2011, Palau and the other Micronesian countries opted to have stand-alone programmes and thus the Palau GEF SGP officially opened in early 2013.

Palau SGP supports projects by community based organizations and non-government organizations, that conserve and restore Palau's environment while enhancing people's lives and well-being. Working in Palau as a stand-alone program for 3 years, Palau SGP will share some of the results of the community projects and how it has aligned its projects to local, national, and global initiatives.

Bridging the gaps through education awareness programs

Ines Kintoki, Sahar Hanser, Lincy Marino, Geraldine Rengiil, PICRC Research and Aquarium Department

The Palau International Coral Reef Center (PICRC) is a leading research institution in Palau and the region. In addition to conducting world-class research, PICRC also conducts education awareness programs to the community. PICRC education staff is constantly working hand-in-hand with PICRC research team on ways to best present the technical research findings to the communities. The target audiences under these programs are the students of Palau. Some of the programs that PICRC has conducted throughout the years include the Annual Arts and Tides Calendar, school visits, and hands-on lab activities. Through these programs, PICRC is able to engage with students and inspire them to learn more and understand the ongoing marine research and conservation efforts of Palau. For example, each year, PICRC education staff runs the Annual Arts and Tides Calendar program where they present a marine-related theme to the schools in Palau. Students get inspired and in return they illustrate their understanding of the theme in the form of drawings. The best drawings are selected to be in the calendar for the following year. Throughout the past years, PICRC has reached a majority of Palau's students. PICRC's education awareness programs will continue to expand and bring the research to the students in hopes to educate and inspire them.

Panel 3: Community Actions

Northern Peleliu Lkes (sandflats): Palau's Most Recent Important Bird and Biodiversity Area (IBA)

Heather Ketebengang, Palau Conservation Society

Important Bird and Biodiversity Areas (IBAs) are internationally significant sites for the conservation of the world's birds and other nature. IBAs are identified using internationally agreed criteria which are applied by BirdLife Partners and experts. The most recently identified site in Palau, The Northern Peleliu Lkes (sandflats), is the only site in Micronesia that meets 2 international criteria, making it a significantly important site nationally, regionally, and globally. The Northern Peleliu Lkes (sandflats) is a site that is being utilized by over 3000 migratory shorebirds species, comprising 25 different species. It also holds more threatened and endangered migratory shorebird species than anywhere else in Palau. Palau is in the East-Asian Australasian Flyway (EAAF), which is the most species rich of all the 9 major flyways but also has the highest proportion of declining populations. Due to habitat loss in other countries in the EAAF, coastal wetlands like the Northern Peleliu Lkes (sandflats) are now critical for the survival of the migratory shorebirds. Designating the Northern Peleliu Lkes (sandflats) as an IBA is the first step to recognizing the importance and significance of a coastal wetland site in Palau. With migratory shorebird conservation as an internationally shared responsibility, Palau needs to take action in the protection of important sites like the Northern Peleliu Lkes (sandflats), which will also fulfill of our commitment as a party to the Convention of Biological Diversity (CBD) and the Convention on Migratory Species (CMS).

How to stop catching tomorrow's fish: A tale from the north

Steven Victor on behalf of Kayangel and Ngarchelong

It has been shown that fishermen are fishing too hard. Fish are getting smaller and very few fish are being left for tomorrow. The impact of not taking action today will mean fewer and smaller fish on our reefs that will have a long lasting impact on our livelihoods and Palau's economy. The fishermen, communities, and the leadership of Kayangel and Ngarchelong have decided to take the bold step of taking the responsibility to manage their fish and their reefs for their fishermen today and tomorrow. The management measures taken include controlling access through permitting system, zoning, species restriction, and size limits. These are tough management actions that the states have taken in hopes that they will help recover their fish and ensure that their fishermen continues to make livelihood from fishing and from their reefs.

Building capacity through PICRC's Internship Programs

Sahar Hanser, Geraldine Rengiil, Ines Kintoki, Lincy Marino, PICRC Research and Aquarium Department

The Palau International Coral Reef Center (PICRC) envisions people empowered with science and knowledge for effective marine conservation and management. The Research and Aquarium Department of PICRC offers a variety of internships, which aims to educate and inspire the next generation of advocates and caretakers of Palau's and the regions environment. Over the years, the Center has continued to make a reputation for itself through its world-class marine research work. With its increasing credibility, the Center continues to attract numerous interns from different corners of the world to come to Palau to be part of the world's efforts to combat marine environmental issues such as climate change, overfishing, and pollution. Both local and foreign students have the opportunity to contribute to this tremendous task through the Center's internship Program. To continue to have opportunities for interns, PICRC has established partnerships with schools, foreign and local, to ensure that internship programs continue to expand and help develop student's capacities for effective marine research, conservation, and management. Already, local capacities have been raised through the Center's internship program; former PICRC interns have gone on to complete their education and are now working for the Center contributing to various conservation efforts in Palau.

Panel 4: Disturbances and Threats

Going to Extremes: Water Temperatures and Tides Influence the Extent of Coral Bleaching and Coral Mortality

Patrick L. Colin, Coral Reef Research Foundation

Both ENSO extremes (El Niño and La Niña) can produce coral mortality throughout the Palau reef tract. It is more commonly

known that La Niña periods of high water temperatures produce coral bleaching and mortality throughout the water column, while the high mean sea levels associated with it do not adversely affect corals. El Niño periods, however, can cause coral mortality through low mean sea levels (shallow corals) and cold water bleaching in deep slope (mesophotic) environments. The twin effects of ENSO extremes serve to limit the depth of Palau coral reefs to only about 60 m and to restrain upward reef growth.

Investigating the drivers and solutions to sedimentation impacts in Babeldaob: Corals reveal land-use change and the role of the Belau Watershed Alliance.

Staci Lewis, M. Barkedull, R. Dunbar, and D. Muccarione, Stanford University
J. Beouch, Ebiil Society

The first component of this project reconstructs a multi-decadal record of sedimentation to inform land-use management decisions in Palau. Coral cores (20-41cm in length) were sampled along a high-to-low sedimentation gradient: near major rivers (high-impact) and ocean (low-impact). The samples were measured for isotopic indicators of environmental conditions: salinity and temperature (δ18O) and light (δ13C). The results indicate an isotopic transition along the high-to-low sedimentation gradient suggesting increased freshwater in Ngeremeduu Bay. The periods of lowest carbon fixation (correlated with low δ13C values) occur in high-impact sites, suggesting light-depleted conditions. These spatial and temporal variations may correlate with land-use change patterns calculated from a twenty-year record of earth-moving permits from EQPB. Trace element data, including Barium to Calcium ratio, indicate a peak in sedimentation during 2006 and 2007, with a gradual increase in sediment leaving the bay since 2004. These results correlate to large-scale road construction and corroborate previous findings that Ngeremeduu Bay has reached a tipping point of retaining sediment. The second component of this project is a case study on the Belau Watershed Alliance (BWA) as a bridging organization in Palau. Initial findings from this study suggest the BWA has gone through three major phases in its 10-year history where it exhibited success in advancing state-led management of ecologically important areas. Today it faces opportunities for change to meet the changing and growing needs of state governments and communities to address watershed issues while balancing economic growth.

Phase shift dynamics following catastrophic disturbance on an Indo-Pacific coral reef system

G. Roff, University of Queensland, Australia
C. Doropoulos, University of Queensland
Y. Golbuu, Palau International Coral Reef Center
P.J. Mumby, University of Queensland

In December 2012, a Category 5 super typhoon passed 50 km south of Palau (Micronesia), causing a catastrophic loss of coral cover. Within weeks following the disturbance, we observed a rapid and extensive phase shift of the macroalgae *Liagora* sp. Comparisons between pre and post-disturbance surveys indicated that relative changes in herbivore biomass and coral cover did not significantly predict the extent of macroalgal cover. In contrast, wave exposure explained >90% of model variance, indicating that environmental conditions play an important role in post-disturbance dynamics. Settlement tiles deployed during the major spawning period (March – April 2013) following the typhoon revealed that reefs that had undergone phase shifts experienced a near complete failure of coral settlement, despite no limitation in larval supply. While the Liagora bloom had started to decline by April 2013, we observed succession to a second macroalgae (*Lobophora variegata*). Experimental manipulations and cage exclusion revealed that Liagora canopies acted as ecological facilitators, providing a 'nursery' exclusion zone from the impact of herbivorous fish, allowing for the establishment of understory Lobophora. While the ephemeral Liagora bloom had disappeared entirely 9 months post-typhoon, the facilitated phase shift to Lobophora has persisted for over 18 months, dominating ~40% of the reef substrate. Collectively, these results provide novel insight into post-disturbance dynamics on Indo-Pacific reefs, and indicate that typhoons may also trigger rather than reverse phase shifts.

Distribution, Impacts, and Biotypes of Coconut Rhinoceros Beetles in Palau

Joel E. Miles, Ph.D., Palau Bureau of Agriculture
Shizu Watanabe, Ph.D., University of Hawaii,
Christopher Kitalong, Ph.D., Palau Community College & Pacific Academic Institute for Research
Nelson Masang, Jr., Palau Community College & PICRC
David Moses, Mindszenty High School,
Minelli Olkeriil, Pacific Academic Institute for Research

From June through August, 2016 we assessed the damage caused by Coconut Rhinoceros Beetles (CRB) to coconut trees throughout the islands of Palau. We assessed over 1,500 trees at almost 50 sites from Kayangel to Merir, using an assessment system developed by the Secretariat of the Pacific Community. We found that approximately 90% of trees assessed showed some damage, but that in most cases the damage was light, and would not affect the yield of the coconuts. However, even light damage affects the usefulness of leaves for weaving and other traditional uses.

We trapped CRB at sites throughout the islands, determined the biotypes of the specimens by extracting their DNA, and checked for the presence of *Oryctes* nudivirus, a naturally occurring virus which was introduced to Palau in the 1970's for CRB control. There are two known biotypes of CRB in the Pacific Islands: the so-called Pacific type (CRB-P), which has been in the Pacific since the early 1900's, and the Guam type (CRB-G), which was first discovered in Guam in 2007, and is now found in Guam, Hawaii, Papua New Guinea, the Solomon Islands, and Palau. Palau is the only place in the Pacific known to have both CRB biotypes. We trapped over 200 CRB from 30 locations throughout Palau, and found that both biotypes of CRB are distributed throughout Palau, with the exception of Sonsorol, which has only CRB-P. The *Oryctes* nudivirus was detected in beetles from all locations except Sonsorol. Interestingly, the nudivirus was found in several specimens of CRB-G, which is supposedly not susceptible to this virus. This may be an indication that the two biotypes are interbreeding in Palau.

We discuss the implications of our findings, and make recommendations for future activities.

Panel 5: Making the Case for Change

Tourism in Palau: The Good, The Bad, & the Ugly

Ron Leidich, Rock Island Kayak Expeditions/Planet Blue Sea Kayak Tours/National Geographic

Palau offers one of the world's greatest marine resources with over 300 uninhabited islands, 72 marine lakes, 1200 species of fish, intact turtle, manta, & shark populations, in addition to a 4,000-year-old culture and intriguing history. The local population is exceptionally well educated, well traveled, and globally aware. Tourism is the primary industry for the Republic of Palau. As such, one would expect the industry to aim for two primary goals: 1. Protection of the Environment & Resources shared between visitors and the local community. 2. Maximum Revenue and Benefits for the stake holders (i.e. the community). Over the past ten years the number of visitors to Palau has skyrocketed. One would expect that the community would be basking in the benefits delivered with the increased numbers of tourists. In fact, this has not been the case. The number of private sector jobs for Palauan citizens has actually fallen over the last decade. The number of government jobs has remained static. This should be viewed as an abject failure of the second goal of tourism. Exacerbating the situation the gross adjusted wage index for every Palauan man, woman, and child has fallen by over $1800.00 per year. In other words, the cost of living has increased disproportionally to the earnings of the stakeholders.

"Tourism in Palau: The Good, The Bad, & the Ugly" will examine the socio-economic details of how such a pristine environment has failed to deliver substantial benefits to the community. The discussion will also cover the environment impacts of exposing a pristine marine environment to 150,000 visitors per year. Despite the environmental damages and the socio-economic disparity, there is great reason for hope. Within the community we find pioneering entrepreneurs striving to make a difference for environment and the community. The reckless approach to tourism has caused social and environmental damage that all citizens have come to experience. The path to a more profitable future is clear and easily achieved.

The Environmental Impact Assessment Process–Is it Working in Palau?

Ann Kitalong, PhD, The Environment, Inc.

During 2011, 8 stakeholders (31%) perceived that the EIA process was effective for the following reasons: (1) enforcement of permit conditions; (2) collection of baseline data; (3) as a planning tool; (4) as a reference document; (5) effective mitigation actions; (6) a process for environmental evaluation. Eighteen stakeholders (69%) perceived that the EIA was inadequate due to the lack of the following: (1) a clearly defined process applicable to all applicants; (2) compensation to States from violations; (3) a mechanism to compensate or to provide specific authorities to the States; (4) a streamlined review process that focuses upon key issues; (5) incorporation of scientific information into the decision making process; (6) a clearly defined reporting process for follow-up and building upon lessons learned; (7) an effective information dissemination; (8) public empowerment; (9) an adequate budget; (10) number of trained staff, and (11) coordination and communication. These limitations resulted in less input into the process; untimely issuance of permits, lack of follow-up action, and the lack of well-defined thresholds for action.

Recommended actions were: increased budget for EQPB programs, more authority to generate revenues from environmental services, build capacity of the board and the staff, raise awareness in the community about the EQPB role and the EIA process, establish a clear efficient set of procedures and thresholds; decentralize responsibilities to the states for monitoring and enforcement; and develop good partnerships with all key stakeholders to ensure the vision of sustainable development is achieved. Some recommended that EQPB be placed under a Ministry to consolidate resources, while others felt EQPB they would be less effective and subject to more political maneuvering under a Ministry.

Balancing Use and Conservation of our Natural Resources with Maintaining a Clean and Safe Environment - a Local Perspective

Iyechad er Edukl *Francis Toribiong, Palau Conservation Society, Board of Directors*

This short presentation will address the need to conserve our natural resources and the related activities that hinder the process of reaching our conservation goals. As a society, we need to make sure we achieve a sustainable and good quality livelihood with a balanced use of our natural resources and environment.

We desire a good and sustainable living for ourselves and our children. We need to have a sustainable living standard and that we need our resources as means of financial supports for our needs. There must be an alternative source of support to make sure we do not totally depend on our natural resources.

Based on my experience and exposure to the works of conservation, I would like to share some ideas that would possibly help revive our traditional conservation methods. In the past, Palau had enjoyed intact, clear waters, and abundance of fish and marine life that the world admired. I wish to convey some thoughts about what needs to be done in order to sustain our environment and bring us to our goal as Pristine Paradise Palau.

I will also share some insights on things that need immediate solutions. We need to take drastic actions regarding the following: Dumpsite, Sewer System, the Inner and Outer reefs. There are good practices that are easily paired with the will and motivation to maintain systems for clean and safe environment.

Panel 6: Climate Change: Impacts and community-based adaptation strategies

El Niño Impacts on Jellyfish Lake

Gerda Ucharm and Sharon Patris, Coral Reef Research Foundation

Climate events, such as El Niño and La Niña, are known to affect Jellyfish Lake and the golden jellyfish population, as seen in our 16 year dataset. The recent 2015 El Niño has provided additional insights into how these events affect this important resource. Using net hauls for jellyfish counts and plankton sampling, water quality monitoring methods and weather monitoring stations, we continue to study how the recent ENSO event has impacted the lake.

Lake water temperature and salinity variation was influenced by El Niño conditions, including drought and the change in ocean thermocline structure. In November 2015, despite recorded cool to average water temperatures, the jellyfish population in the lake began a downward trend from a monthly average of

5 million jellies to 3 million, and continued to decline until the population reached zero in May 2016. Due to the lack of rainfall, the upland nutrient input into the lake decreased causing changes in the lake's nutrient cycle. This, in turn, affected the zooplankton and phytoplankton community which likely played a role in the jellyfish population disappearance. Toward the end of the El Niño, increased rainfall and regional conditions caused the lake water to warm up from an average temperature of 29˚C to 33˚C. This has likely further stressed the lake system and survivorship of juvenile jellyfish. Therefore we continue to monitor the lake's dynamics and the jellyfish population to determine recovery rates and how ENSO events will impact marine lakes in the future.

Participatory Assessment of Climate Change Vulnerability and Adaptation (V&A) of 13 states in Palau

Carol O. Emaurois, In Country Coordinator, University of South Pacific, Laucala Fiji.

The USP EU GCCA project in Palau conducted assessments on climate change vulnerability and adaptation in 13 states in Palau between 2013 and 2016. The workshops were to develop an understanding of the level of community knowledge and attitudes towards climate change; to explore the current status of livelihood resources in the community; to identify the most prominent community concerns and propose appropriate solutions for long-term sustainability; and to identify the most feasible and culturally appropriate adaptation measures, using the PACE-SD Strategic Adaptation Framework as an implementation.

Assessments were conducted in the 13 states over three days with a total of 259 participants. The participants were divided into the following Focus Group Discussion: Group 1: Governance and Socio-Economic Resources, Group 2: Disaster Risk Management , Water Resources and Security / Health and Sanitation / Energy Resources and Information Communication Technology , Group 3: Food Resources and Security / Natural Resources. The group discussion focused on pre-developed questionnaires. Each group was asked to give a presentation based on their answers. Each group had to identify problems, causes and solutions to each of the answers in their group. The V&A toolkit used in these assessments is the PACE-SD Guidebook: Participatory Assessment of Vulnerability and Adaptation.

The results based on these assessments indicate that most of the states in Palau identify governance and socio economic resources to have the most problems and find it difficult to provide solutions. Water Resources and Security is a sector that 12 states regarded as the most vulnerable resources and have a greater impact on their livelihood. Health and Sanitation is a problem in all the 13 states. Solid waste management is a growing issue and concerns with all the states. Food Resources and Security is very vulnerable due to decreasing number of women cultivating taros in addition to the long dry season that Palau experienced in 2016 coupled with wider spread of taro diseases in all the states. There were 57% women and 43% men who participated in these assessments. More than half of the participants were 50 years old and over. About 96% of participants were concern about the impact of climate change, over 50% of these participants were very or extremely concern.

Climate Change Adaptation in Melekeok

Kevin Mesebeluu, Ngardok Nature Reserve, Melekeok State

My presentation will discuss the creation of the 3D map of Melekeok State and its use as a tool to address climate change issues. The map is important due to its involvement of the youth and elders of the community. The identified climate change adaptation options are as follows:

Goal 1: Water Security

- Re-vegetation of upland forests for water security
- Guidance documents for development on lease land and upland soil

Goal 2: Reef Health and Resiliency

- Technical support to explore natural defenses for shoreline erosion
- Passage of a new MPA that protects key species that have been identified through community consultations

Goal 3: Strengthening current infrastructure

- Adopt and implement new climate resilient building codes for existing shoreline homes and structures

I will also discuss options that have come out of a complete socioeconomic survey of over 70 households in the state, which identified the options and established a baseline of the current knowledge, attitudes, and perceptions on climate change. The survey also identified vulnerable areas in the community to climate change. I will discuss the process of selecting two of the five adaptation options identified based on a Cost-Benefit Analysis.

Posters

Due to space limitations, posters were not displayed at the Symposium.

Island erosion and migration in Hatohobei State, Palau

Sharon Patris and Patrick L. Colin, Coral Reef Research Foundation

For small island nations, global warming and climate change has prompted predictions of disappearing islands swallowed by sea level rise. However, recent studies have shown dynamic reef island conditions over time, indicating that the situation is not so simple. Here, we assess the coastal changes on two remote and near-equatorial southwest islands of Palau using satellite imagery, historical aerial/coastal photographs, and GPS-based land surveys. Hatohobei (or Tobi) is an oceanic island surrounded by fringing reef and has experienced areas of both erosion and accretion of its coastal beaches and land in past decades. Helen Reef is a medium-sized protected coral atoll with a single small sand spit island, an important turtle and bird nesting site. In the past 25 years Helen Reef Island has changed slightly in size and shape, but more critically has migrated sufficiently that only 10% of the island that was land in 1992 is still part of the present island. The island has literally "left behind" most of its larger vegetation so that in the last 25 years its general appearance has greatly changed. We examine changes of both islands relative to natural conditions and human influences and have attempted to obtain precise data that will allow detailed determination of changes in the future.

Water Temperature Patterns on the Palau reef tract 1999-2014: Outer reef slope

Patrick L. Colin, Coral Reef Research Foundation
Dan Rudnick, Travis Schramek, & Eric Terrill, Scripps Institution of Oceanography

Over a 15 year period (1999-2014) the vertical and temporal patterns of water temperatures throughout the main island group of the Republic of Palau, western Caroline Islands, have been characterized by recording thermographs. Outer slope mesophotic and deeper reef environments (30 to 90 m depth) proved to have high variation over dual time scales. Short term variation (hourly to daily) of 4-10oC often occurred while monthly to yearly shifts in mean values had similar values. The water temperatures in mesophotic regions often were at or below the 20˚C level, probably making such areas thermally stressful and potentially limiting to reef corals. The data are examined in the context of both local and global climate conditions with a fair correlation with Pacific Decadal Oscillation values. During a La Nina coral bleaching event in 2010, the water column became nearly unithermal (29.5-30.5˚C) from the surface to 90 m depth providing no deep refugia from high temperature. Most documentation of bleaching event temperatures is limited to the upper 10-20 m of the water column, however the temperature structure and the extent of bleaching at greater depths is important, but largely ignored.

The importance of long-term monitoring to assess the effectiveness of seagrass beds marine protected areas in Palau, Micronesia

Geory Mereb, Randa Jonathan, Dawnette Odsulong, Evelyn I. Otto, Marine Gouezo, Shirley Koshiba, Yimnang Golbuu, PICRC

Seagrass beds provide a number of ecosystem goods and services which include nursery grounds, habitat for fish, carbon sequestration, sediment trapping, and nutrient filtration The loss of seagrass beds often leads to decrease of fish and invertebrates' populations and increase in sedimentation rate. In Palau, several seagrass beds are protected and part of the Palau Protected Areas Network (PAN) that aims at effectively conserve marine resources in Palau. However, since the implementation of the PAN, few studies have looked at the impacts of protection on seagrass bed communities. With long term monitoring data collected bi-annually since 2011 on fish, invertebrates and seagrass communities, and this study showed the effect of protection at four spatially spread seagrass beds. Results demonstrated that protected seagrass beds have higher marine resources than their non-protected reference sites. In addition, fish and invertebrates densities and seagrass cover within MPAs showed different trends among the four MPAs. This implies that protection from fishing solely is benefiting seagrass beds in Palau to a certain extent. Other non-measured variables such as water quality should be considered for more effective resource management.

Supertyphoon Haiyan: Inundation, Erosion and Effects at Kayangel Atoll and Ngeruangel, Republic of Palau

Gerda Ucharm and Patrick L. Colin, Coral Reef Research Foundation

On November 25-26 2014, Supertyphoon Haiyan passed directly over Kayangel Atoll generating massive waves on its northeast through southeast quadrants and severely damaged reefs on the outer slope on the northern and eastern exposures. The waves eroded areas of the eastern shores of the islands, sand banks and flats within the lagoon, but left western to southwestern outer reefs and lagoon seagrass and patch reef communities largely untouched. Salt water inundation and spray contaminated the fresh water lens of Kayangel Island and the recovery of the fresh water lens was examined for one year. The connections between lagoon and island ground water lenses were determined using pressure loggers while salinity/depth of the island ground water lens measured using hand-held water quality monitors. Aerial photographs before, immediately after and continuing to the present were used to examine inundation zones and recovery of vegetation on the islands. Ground truth surveys were used validate interpretation of aerial images. At the nearby Ngeruangel/Velasco reef sunken atoll system the single island (Ngerungel) was swept clean by the storm waves. The island grew slightly in size and elevation and migrated about 50 m distance from the storm. Nesting terns returned to the island within one month. Marine communities on Velasco Reef were severely affected with massive shifting of sediments and erosion of the unusual *Thalassodendron ciliatum* beds found on the sunken atoll rim.

Day 2

Speakers and topics for Day 2 were invited based on survey results and in order to find solutions for problems identified in abstracts. Thus there are few abstracts for Day 2.

Plenary

Working With, Not Against, Coral-Reef Fisheries

Charles Birkeland, Department of Biology, University of Hawaii

The fisheries policies of some Pacific islanders are more in harmony with the biology of their resources than are some of the fisheries policies of more industrialized countries. Exclusive local ownership of natural resources in Palau encourages adaptive management on biologically relevant scales of time and space, and promotes responsibility by reducing the tragedy of the commons. The presence of large individuals in fish populations and adequate size of spawning aggregations are more efficient and meaningful cues for timely management than are surveys of abundance or biomass. Taking fish from populations more than halfway to their carrying capacity is working with the fishery because removing fishes potentially increases population production by negative feedback. Taking the same amount of fish from a population below halfway to their carrying capacity is working against the fishery because reducing the reproductive stock potentially reduces the population production by positive feedback. Reef fish are consumed locally, while Palauan laws ban the export of reef resources. This is consistent with the high gross primary production with little excess net production from undisturbed coral-reef ecosystems. The relatively rapid growth rates, short life-spans, reliable recruitment, and wide-ranging movements of open-ocean fishes such as scombrids make them much more productive than coral-reef fishes. The greater fisheries yield per square kilometer in the open ocean multiplied by well over a thousand times the area of the exclusive economic zone over that of Palau's coral reefs should encourage Palauans to keep reef-fishes for subsistence and to feed tourists open-ocean fishes.

National Launching Event

Measuring the effectiveness of managing protected areas through the Green Fee Sustainable Financing Mechanism and the Protected Areas Management Effectiveness tool

King Sam, PAN Manager, MNRET

The Palau Protected Areas Network is a comprehensive framework unlike any other, designed to promote the effective conservation of our rich natural and cultural heritage. It is a national commitment that demonstrates how important we value our environment and how it defines our way of life.

Since its inception in 2003, a sustainable financing mechanism in the Green Fee was established, injecting over $5 million into the local economy and employing a range of enforcement and conservation officers across the country through the state governments. Palau's endowment with the Micronesia Challenge is at approximately $9 million with the achievable target of $10 million.

After several years of supporting states' efforts in managing their resources and collaborating with several important partners, the Network has produced a management baseline. Palau far surpasses global goals and averages by having a high percentage of sites governed by local authorities. While more work lies ahead, there is national capacity to measure management effectiveness over time to safeguard the sustainable use of our limited natural and cultural resources.

Panel: Laying the Groundwork for Smart Growth

Water quality investigations: why land-use planning and marine zoning is necessary.

Metiek Kimie Ngirchechol, Palau Environment Quality Protection Board
Peter Peshut, Ph. D, Nimbus Environmental Services
Roxanne Y. Blesam, EQPB
Lynna Thomas, EQPB

State governments and developers seeking projects which involve overwater structures or point-source discharges may see regulatory requirements as a challenge to overcome. However, these regulations there for the protection of the environment. One such regulation is the Palau EQPB Marine and Fresh Water Quality Regulation, which has classifications that determine the types of allowed activities such as overwater bungalows, aquaculture discharge, dredging, etc. Most waters around Palau fall under the highest order of protection Class AA, which does not allow for such activities.

Decision-makers need to understand the requirements from the regulatory arena and that a key step in future development lies in delineating or zoning areas for overwater activities. Hence national and state governments need to be aware of this in order to properly plan future developments and zone accordingly.

Water quality data in the Palau for informed decision making for over-water projects is still deficient. This presentation includes a brief description of a water quality project conducted in Palau, devised to determine nutrient levels in Aquaculture facilities. It is concluded that that un-diluted aquaculture pond water has elevated Total Nitrogen and Total Phosphorus that violates Palau Water Quality Standards criteria and that treatment facilities may be inadequate to treat these levels.

So, despite numerous environmental targets and policy measures to reduce nutrient and contaminant inputs, environmental targets are not likely to be met. Rather than wait until investments come in and dictate the direction of development, we need to be proactive and develop master plans with land-use and marine planning, which will contribute to a healthier rivers and coastlines. Given the impending need to address climate change and disaster risk management, land use and marine planning is essential.

State governments should embrace these requirements and work with communities to commit to and share a set of ecological sound principles and values that are incorporated into land use plans, so that progress of development will move forward steadily in a unified vision to minimize impacts to OUR PALAU.

Panel: Profitable & Sustainable Tourism for Everyone

Tourism Impacts: Framework

Bouveau Anastacio, Director, Bureau of Tourism, MNRET

"Our Environment…" Why is this important to the Tourism Industry? The Environment is Palau's main product in the Tourism Industry—it is our biggest asset and visitors pay big dollars to fly to Palau to experience our Pristine Waters and Land Tours. However, we have been operating our Tourism Industry without a Responsible Tourism Framework since its inception. With the increase in visitors in recent times, including new emerging markets, a framework is necessary to address some of the rising issues that are evolving as a result.

Currently, the Bureau of Tourism with consultation from the Palau Conservation Society and advisory from other partner-members in the National Government(s), State Government(s), Semi-Government agencies and Non-Government Organizations are working on a Responsible Tourism Framework for the very purpose of addressing these issues that are not only disturbing our Environment but our economic, social, and cultural well-being.

Although this Responsible Tourism Framework is still being drafted with a projected completion date of December 2016, it has a policy statement that is significant in its whole entirety. Whereas, The Republic of Palau acknowledges tourism's significant contribution to the economic and social well-being of the country, and Therefore, Palau fully supports the development of tourism as a key economic sector; However, Palau recognizes that unplanned and unmanaged growth of tourism has negative economic, social, cultural and environmental impacts in the country, and As such, Palau commits to adopting a Responsible Tourism approach to managing Palau's tourism industry to ensure continued positive economic, social, cultural, and environmental benefits for the people of Palau.

Bottom line, the vision we want for Palau is a Pristine Paradise Palau for Everyone. This means that visitors will feel Pristine Paradise Palau from arrival to departure and at the same time product & service providers in the industry are able to deliver a Pristine Paradise Palau for everyone. Of course, this does not mean we grow a 2nd Generation UAB that will deplete all our resources. But rather, the mission is to grow and sustain a visitor industry that is Respectful of our people and environment, ensures the Optimum flow and retention of revenue in our economy, and consistently delivers the Promise of a Pristine Paradise Palau experience to all.

In order to meet this vision, the National Government has set goals for the Framework that will benefit not only Our Environment but the well-being of the Palauan People. We have set out (6) Six Targets that will guide the framework:

1. Responsible tourism development, management, and enforcement is prioritized in national development plans and coordinated across national and local government sectors
2. Visitor-to-Resident ratio reflects sustainable carrying capacity
3. High-value, low-impact consumer segments are the core of Palau's visitor industry.
4. Visitor experience is aligned with the Pristine Paradise Palau brand
5. Tourism value chain reflects optimal retention of revenue in local economy
6. Communities are actively engaged in tourism planning and decision making

The Bureau of Tourism (BOT) was also very fortunate to receive funding from the Department of Interior (DOI) to assist in the development of the Responsible Tourism Framework. Out of this project, BOT was able to procure various consultancy work(s) that will assist in completing significant components for the framework. These components will play an important role in the Environment and also assist in shaping the future of tourism in Palau. The following are the components:

- Certification Standards & Ratings
- Palau Product Authentication
- Outreach & Communications
- Airport Exit Survey
- Tourism Database
- Regulatory Framework

The project with all the consultancy work to produce these components has been successfully on-going for almost a year, and the progress is near to completion. In the end, The Future of our Tourism Industry lies not only in the hands of the Public & Private Sector but in the hands of EVERYONE residing in Palau to ensure that the Responsible Tourism Approach and the Pristine Paradise Palau Branding is integrated within our communities; So Palau gains positive benefits while sustaining its pristine environment while our visitors receive the Pristine Paradise Palau Experience.

Sustainable Tourism in Melekeok

Kevin Mesebelau, Ngardok Nature Reserve, Melekeok State

I will discuss Melekeok's response to a drastic increase in tourism by detailing work on a "Responsible Tourism" campaign that is currently underway through PCS and partner KSG.

Full Symposium Program

Appendix 2

Tuesday, August 23, 2016 (Day 1)

7:45am– 8:30am	Registration
8:30am – 8:40am	Opening of Symposium *Kambes O. Kesolei, Master of Ceremony*
	Opening Remarks *Hon. Umiich Sengebau, Minister of Natural Resources, Environment & Tourism and Chair, National Environmental Protection Council*
8:40am- 9:00am	Special Remarks *H.E. Tommy E. Remengesau, Jr., President, Republic of Palau*
9:00am- 9:20am	Special presentation: An Overview of Research and Conservation Efforts in Palau since the 1990's: An Outsider's Perspective *Prof. Robert H. Richmond, University of Hawaii*
9:20am– 9:30am	Survey Results that Shaped the 1st National Environment Symposium *Dr. Yimnang Golbuu, CEO, Palau International Coral Reef Center (PICRC)*
9:30am –10:45am	**Panel 1: Fisheries** Moderator: *Steven Victor, Director, TNC Micronesia* Presenters: *Lukes Isechal, Researcher, PICRC* *Dawnette U. Olsudong, Research Assistant, PICRC* *Dr. Steven Linfield, Biologist, CRRF* *Mark Priest, Ph.D. Candidate, University of Queensland* *Yvonne Ueda, Tuna Fisheries Improvement Coordinator, TNC*
10:45am – 11:00am	Coffee break
11:00am – 12:00pm	**Panel 2: Partnerships: Community, State & National Programs** Moderator: *Lolita Gibbons-Decherong, Acting Executive Director, PCS* Presenters: *Victor Nestor, Researcher, PICRC* *Kiblas Soaladoah, Nat. Coordinator, GEF SGP* *Ines Kintoki, Assistant Communications & Outreach Officer, PICRC*
12:00am – 1:00pm	**Panel 3: Community Actions** Moderator: *Collin Joseph, Manager, Coastal Management Office, Koror State Government (KSG)* Presenters: *Heather Ketebengang, Conservation & Protected Areas Program Coordinator, PCS* *Steven Victor, Director, TNC Micronesia* *Sahar Hanser, Communications & Outreach Officer, PICRC*
1:00pm – 2:00pm	Lunch
2:00pm –3:00pm	**Panel 4: Disturbance & Threats** Moderator: *Lukes Isechal, PICRC* Presenters: *Dr. Pat Colin, Director/President, CRRF* *Staci Lewis, Ph.D. Candidate, Stanford University* *Dr. George Roff, Postdoctoral Research Fellow, University of Queensland* *Minelli Olkeriil & David Moses, Mindszenty High School Student Interns, Pacific Academic Institute for Research (PAIR)*
3:00pm –4:00pm	**Panel 5: Making the Case for Change** Moderator: *Madelsar Ngiraingas, Member, Palau Conservation Consortium* Presenters: *Ron Leidich, Biologist/Manager, Planet Blue Kayaks* *Dr. Ann Kitalong, Project Manager, The Environment Inc. (TEI)* Yechad er Edukl *Francis Toribiong, Board Member, PCS*
4:00pm – 4:15pm	Coffee break
4:15pm – 5:15pm	**Panel 6: Climate Change: Impacts and community-based adaptation strategies** Moderator: *Charlene Mersai, Secretariat, NEPC* Presenters: *Gerda Ucharm, Research Biologist, CRRF* *Carol Emaurois, In-Country Coordinator, University of the South Pacific* *Kevin Mesebeluu, Program Manager, Ngardok Nature Reserve (NNR), Melekeok State Government*
5:15pm	**Closing,** *MC*

Wednesday August 24, 2016 (Day 2)

7:45am – 8:30am	Registration
8:30am – 8:35am	Symposium opening *Kambes Kesolei, Master of Ceremony (MC)* Opening prayer *Asap Bukurrou, Chief Aquarist, PICRC*
8:35am – 8:45am	Opening remarks *Rubekul Belau*
8:45am- 9:00am	Special remarks *H.E. Tommy E. Remengesau Jr., President, Republic of Palau*
9:00am- 9:20am	Special presentation: Working With, Not Against, Coral-Reef Fisheries *Dr. Charles Birkland, University of Hawaii*
9:20am – 10:30am	**Overview of national launching** *Hon. Elbuchel Sadang, Minister of Finance* Protected Areas Network Status Report 2003-2015 *King Sam, PAN Manager, MNRET* Palau's National Biodiversity Strategies and Action Plan: Promoting Wise Development to Achieve Conservation and Sustainable Use of Biodiversity 2016-2026 *Gwen Sisior, Project Manager, MNRET* Palau Climate Change Policy for Climate and Disaster Resilient Low Emissions Development *Erbai Matsutaro, Climate Change Coordinator, Bureau of Budget & Planning, MOF*
10:30am – 10:40am	Coffee break
10:40am –10:55am	Highlights from technical presentations *Lolita Gibbons-Decherong, Acting Executive Director, Palau Conservation Society*
10:55am –11:00am	Introduction of Panels *Kambes Kesolei, MC*
11:00am – 12:00pm	**Panel 1: Sustainable Fisheries for Food Security** Moderator: *Steven Victor, Director, TNC Micronesia* Speakers: Near-shore fisheries *Bridget Adachi, Dir., Northern Reef Fisheries Cooperative* Aquaculture *Leon Remengesau, Acting Director, Bureau of Marine Resources, MNRET* Offshore fisheries *Asterio Takasi, Manager, Tuna Project, Bureau of Marine Resources, MNRET*
12:00pm- 1:00pm	**Panel 2: Laying the Groundwork for Smart Growth** Moderator: *Roxanne Y. Blesam, Executive Officer, Environmental Quality Protection Board (EQPB)* Speakers: Koror-Airai Sanitation Project (KASP) *Anthony Rudimch, Project Manager, KASP, PPUC & Kambes Kesolei, Community Awareness Participation/Gender Specialist, KASP* Water quality *Metiek Kimie Ngirchechol, Lab Supervisor, EQPB* Solid Waste Management *Brian Melairei, Director, Bureau of Public Works, MPIIC*
1:00pm – 2:00pm	Lunch
2:00pm – 3:00pm	**Panel 3: Ensuring our Tourism Industry is Sustainable and Profitable for Everyone** Moderator: *Umai Basilius, Program Manager, PCS* Speakers: National Tourism Framework *Bouveau Anastacio, Director, Bureau of Tourism, MNRET* Sustainable Tourism Project *Kevin Mesebeluu, Program Manager, Ngardok Nature Reserve, Melekeok State Government*
3:00pm – 3:15pm	Synopsis of Panel Presentations *Dr. Yimnang Golbuu, CEO, Palau International Coral Reef Center*
3:15pm – 3:30pm	Coffee break
3:30pm – 3:45pm	Response from the Governor's Association *Hon. Yoshitaka Adachi, Governor, Koror State*
3:45pm – 4:00pm	Response from the House of Delegates *9th Olbiil Era Kelulau*
4:00pm – 4:15pm	Response from the Senate *9th Olbiil Era Kelulau*
4:15pm – 4:30pm	**Closing** *Hon. Umiich Sengebau, Minister, MNRET*
4:30pm	Photo session

Symposium Speakers & Rapporteurs

Appendix 3

Presenters and Moderators (In order of appearance)

1. Kambes Kesolei, Community Awareness and Participation/ Gender Specialist, Palau Public Utilities Corporation
2. Hon. Umiich Sengebau, Minister, Ministry of Natural Resources, Environment and Tourism (MNRET)
3. H. E. Tommy E. Remengesau, Jr., President, Republic of Palau
4. Robert H. Richmond, Professor, Kewalo Marine Laboratory, University of Hawaii
5. Dr. Yimnang Golbuu, Chief Executive Officer, Palau International Coral Reef Center
6. Steven Victor, Director, The Nature Conservancy - Micronesia
7. Lukes Isechal, Researcher, Palau International Coral Reef Center
8. Dawnette U. Olsudong, Research Assistant, Palau International Coral Reef Center
9. Dr. Steven Linfield, Biologist, Coral Reef Research Foundation
10. Mark Priest, Ph.D. Candidate, University of Queensland
11. Yvonne Ueda, Tuna Fisheries Improvement Coordinator, The Nature Conservancy - Micronesia
12. Lolita Gibbons-Decherong, Acting Executive Director, Palau Conservation Society
13. Victor Nestor, Researcher, Palau International Coral Reef Center
14. Kiblas Soaladoab, National Coordinator, Global Environment Fund - Small Grants Program (GEF-SGP)
15. Ines Kintoki, Assistant Communications & Outreach Officer, Palau International Coral Reef Center
16. Collin Joseph, Manager, Coastal Management Office, Koror State Government
17. Heather Ketebengang, Conservation & Protected Areas Program Coordinator, Palau Conservation Society
18. Happy Fritz, Fisheries Coordinator, The Nature Conservancy - Micronesia
19. Sahar Hanser, Communications & Outreach Officer, Palau International Coral Reef Center
20. Dr. Pat Colin, Director/President, Coral Reef Research Foundation
21. Staci Lewis, Ph.D. Candidate, Stanford University
22. Dr. George Roff, Postdoctoral Research Fellow, University of Queensland
23. Minelli Olkeriil, Student Intern, Mindszenty High School & Pacific Academic Institute for Research (PAIR)
24. David Moses, Student, Student Intern, Mindszenty High School & Pacific Academic Institute for Research (PAIR)
25. Madelsar Ngiraingas, Executive Director, Belau Tourism Association
26. Ron Leidich, Biologist/Manager, Planet Blue Kayaks/Paddling Palau
27. Dr. Ann Kitalong, Project Manager, The Environment Inc.
28. Francis Toribiong, Board Member, Palau Conservation Society
29. Charlene Mersai, National Environment Coordinator, National Environmental Protection Council (NEPC)
30. Gerda Ucharm, Research Biologist, Coral Reef Research Foundation
31. Carol Emaurois, In-Country Coordinator, University of the South Pacific
32. Kevin Mesebeluu, Program Manager, Ngardok Nature Reserve (NNR), Melekeok State Government
33. Asap Bukurrou, Chief Aquarist, Palau International Coral Reef Center
34. Beouch Kyoshi Rechucher, Member, Rubekul Belau
35. Dr. Charles Birkland, Professor Emeritus, Hawaii Cooperative Fisheries Research Unit, University of Hawaii
36. King Sam, PAN Manager, Protected Areas Network (PAN) Office, MNRET
37. Gwen Sisior, Project Manager, Ministry of Natural Resources, Environment & Tourism (MNRET)
38. Erbai Matsutaro, Climate Change Coordinator, Bureau of Budget & Planning, Ministry of Finance (MOF)
39. Bridget Adachi, Director, Northern Reef Fisheries Cooperative
40. Leon Remengesau, Acting Director, Bureau of Marine Resources, MNRET
41. Asterio Takasi, Manager, Tuna Project, Bureau of Marine Resources, MNRET
42. Roxanne Siual Blesam, Executive Officer, Environmental Quality Protection Board
43. Anthony Rudimch, Project Manager, Koror-Airai Sanitation Project (KASP), PPUC
44. Metiek Kimie Ngirchechol, Lab Supervisor, Environmental Quality Protection Board
45. Brian Melairei, Director, Bureau of Public Works, MPIIC
46. Umai Basilius, Program Manager, Palau Conservation Society
47. Bouveau Anastacio, Director, Bureau of Tourism, MNRET

Rapporteurs

1. Umai Basilius, Program Manager, Palau Conservation Society
2. Metiek Kimie Ngirchechol, Lab Supervisor, Environmental Quality Protection Board
3. Lorraine Rivera, Climate Mitigation Coordinator, Office of Climate Change
4. Kulie Rengulbai, Education Officer, Environmental Quality Protection Board
5. Sharon Sakuma, UN Coordination Officer, United Nations Joint Presence Office
6. Misty Iluches, Admin Officer, Palau National Marine Sanctuary Office
7. Bernadette Besebes, Program Coordinator, Palau Conservation Society

House of Delegates Position Paper

Appendix 4

Introduction

The House of Delegates of the Ninth *Olbiil Era Kelulau* is pleased to have been invited to write this Position Paper for the Republic of Palau's First National Environment Symposium held on August 23rd and 24th, 2016. The three areas identified in the symposium to be the top three environmental issues in Palau today are overfishing and food security, infrastructure development and pollution, and the environmental impacts of tourism. The House of Delegates agrees that these are the foremost environmental concerns in shaping Palau's national policy today, in the near future, and for generations to come. The climate, ecosystems, location, and size of our island make Palau truly a paradise and these conditions allow humans and other forms of precious life to be able to thrive in abundance. On the other hand, because of the unique natural character of Palau, protecting and conserving our environment also poses unique challenges that we must face every day.

Although we may sometimes forget how exceptionally blessed we are to live in such a fruitful setting, we must remember that fresh fish and local produce available every day is a rarity in the world and a bedrock of our healthy Palauan way of life. Pulling from traditional means of sustainable harvest, Palau has adapted to modern realities of foreign and commercial fishing by instituting regulations to slow down fish harvest. Overfishing is a significant threat to national food security and with the use of our encyclopedic knowledge of our waters we are instituting ecosystem-based management of marine resources. It has also become necessary for us to expand our fisheries options in order to ensure food security, including exploration of appropriate aquaculture and offshore fisheries options, beyond our traditional fishing methods and fishing grounds. Additionally, to ensure a bounty of nutritious food for years to come, we also encourage local production of traditional and newly introduced food crops.

Further, while our natural environment has bestowed upon Palau's people a great bounty of resources, we must sacrifice some of our natural assets in order to participate in the global economy. Palau has chosen to do this in a way that has the highest potential for industry-ecosystem symbiosis: tourism. Tourists come from around the globe, especially from heavily industrialized areas, in order to experience the deep fulfillment that comes from engaging with the natural world. Tourists also come for our fine dining, luxury accommodations, souvenir shopping, and other modern activities. While tourism has given our island much needed capital, it also taxed our infrastructure, especially public sanitation.

The House of Delegates, in its capacity as a lawmaking body, has proactively sought to address each of these issues. The legislation introduced in the Ninth Olbiil Era Kelulau has touched on curbing overfishing and incentivizing agriculture, calling for cooperation in securing funds for sewer projects, and ensuring that the tourism industry pays its fair share for infrastructure. We are pleased to present you with this paper that outlines some of our recent accomplishments and to provide examples of our policy interests.

Overfishing and Food Security

The House of Delegates has taken two main approaches to reducing overfishing and promoting food security for Palau. First, it has created laws which prohibit certain types and quantities of fishing that tend to lead to stock depletion. Second, it has encouraged local agriculture through loan programs and tax incentives. There are four significant bills that the House of Delegates of the Ninth *Olbiil Era Kelulau* has introduced in order to restrict unsustainable fishing practices and there are two bill aimed at enhancing local agricultural development.

First in 2013 the House of Delegates understood the need to protect all marine mammals to align the Republic with the global effort to prevent the extinction of these vulnerable megafauna. Thus, it introduced a bill to place a moratorium on the taking of all mammal species within the territorial waters and exclusive economic zone of the Republic of Palau. The law at the time only prohibited the intentional taking or harassment of dugongs or the possession or sale of their parts, except when used as historical and traditional accessories or tools. The House of Delegates transmitted a bill that would extend this prohibition to include all marine mammals including dolphins, which are frequent visitors to our island's waters and are an invaluable yet threatened marine species. Although the House affirms the cultural importance of dugong harvest, it also recognizes that the moratorium is necessary to preserve the species from extinction and to allow future generations to be able to experience this magnificent creature. Similarly with dolphins, the House identified a need to protect an at-risk species so that it may continue to thrive in Palau and on this planet for centuries to come.

Then in 2014, the House of Delegates addressed the need to repopulate the nation's oceans stocks of Bumphead Parrotfish (*kemedukl*), a local treasure. Thus it introduced a bill to allow for captive breeding of the Bumphead Parrotfish in order to regenerate depleted schools. The law at the time banned breeding of the species because captive propagation posed environmental and technological barriers. The House of Delegates became aware of new scientific advances which would make Bumphead Parrotfish propagation feasible and ecologically sound and introduced a bill to allow it.

In 2015, the House of Delegates recognized that the existing law on fishing net size was not specific enough to prevent the use of nets that lead to the incidental taking of immature fish and to ensure consistent enforcement. Hence it introduced a bill to utilize the industry standard for net measurement in order to protect local fish stocks from overfishing. The bill also provided clearer enforcement protocol to ensure fair enforcement of the law for all fishermen.

In late 2015, the House of Delegates learned that Palau's species of Giant clam (*Tridacna gigas, otkang*) had a rate of harvest that was alarmingly higher than the rate of growth. Consequently it introduced a bill which placed a moratorium on the sale and purchase of Palau's giant clams thus banning commercial harvest and only allowing subsistence harvest subject to state regulation. Also the bill specified protected sites for the assisted spawning of new clams and it continued the Giant Clam Seed Sustainability Project Fund.

These four bills aimed at reducing overfishing and intended to mitigate its dramatic negative impact on food security for Palauans and hindrance to residents in meeting their protein needs. Additionally, the House of Delegates knew that food security for fruits and starches was necessary for complete nutrition in Palau and so it introduced two bills aimed at spurring interest in local agricultural production. Beyond the health benefits of eating local plants, a robust local agriculture market reduces the nation's dependence on food imports and the resulting container waste that ends up in our limited landfills.

In 2013, the House of Delegates introduced a bill to establish a loan program for resident farmers. The bill provided for financing through the National Development Bank of Palau, which would work in conjunction with the Bureau of Agriculture and the Bureau of Marine Resources to determine the feasibility of proposed projects. The goal of the loans would be to increase local food production. The same justifications also prompted the House of Delegates to introduce a bill in 2013 to extend tax incentives for businesses engaged in agricultural and aquaculture. The bill offered to alleviate the tax burden of these businesses in order to induce greater production levels.

By keeping abreast of the condition of Palau's marine ecosystems and advancements food production technology, the House of Delegates has been able to respond quickly and effectively to endangered marine mammals and depleted stocks of marine life. These types of legislative efforts will ensure decades and centuries of abundant ocean resources. Further, the promotion of local agricultural and aquaculture development by the House envisions a Palau that is independently able to feed its families and communities for generations to come.

Infrastructure and Tourism

The House of Delegates has worked to improve the condition of the nation's sewage infrastructure which is a significant but ameliorable source of pollution in Palau. Considerable growth of the tourism industry, the bulwark of the nation's economy, has increased the demand on the sewage systems in the more populated areas of Koror and to a lesser extent Airai and the other states in Babeldaob. Further, the tropical climate naturally degrades most types of infrastructure at a greater rate than in more temperate areas. The House's approach to balancing the goals of attracting tourism and preserving our pristine environment has had several components. First, it passed legislation which led to Palau securing funds for sewage improvement. The House also proposed legislation to fortify water quality governance in an effort to reduce the burden of source pollution on sewage treatment facilities. Finally, the House has worked extensively with tourism-related taxes and fees in order to ensure the sector's contribution is proportionate to its load.

Regarding infrastructure improvement, the House of Delegates initiated a Joint Resolution urging the President, His Excellency Tommy Remengesau to secure loans from the Asian Development Bank to renovate old sewage systems and construct new infrastructure. The resolution was successful and the Office of the President was able to secure over $20 million in funding for the sewage improvement. Now, the nationally-administered Koror-Airai Sewer Project is up and running thanks to the cooperation between the House, the Senate, and the President. The House Joint Resolution was the catalyst for successfully implementing the nation's sewage control strategy.

On the water quality front, the House of Delegates has introduced bills to preserve the integrity of Palau's fresh and marine waters. In 2013, the House introduced a bill to empower the Environmental Quality Protection Board to create regulations and a permitting system for the abstraction of fresh water. In 2014, the House introduced a bill to require automotive shops to dispose of motor oil in accordance with environmental regulations and to track and report disposal. This measure aimed to ensure that motor oil, an especially harmful pollutant, did not find its way into the nation's ground, surface, or sea water. Then in 2015, the House introduced a bill that prohibited the importation of asbestos-lined pipes into Palau to prevent leeching of the toxic substance into drinking water and the ocean. All of these measures aimed to reduce or eliminate water pollution at the source to lessen the amount of pollution requiring removal at the sewage treatment facilities.

The House of Delegates has also worked extensively to effectuate an advantageous legal schema of taxes and fees derived from tourism. Generally, the House of Delegates' aim to increase public revenue incidentally increases funding for sewage projects as these are among the nation's highest priorities in terms of public spending. This revenue also provides great social benefit to the Republic in numerous areas and will be discussed in further detail in the following section.

Tourism and the Environment

Our tourism-based economy supports all aspects of life in Palau and yet it often has a harmful impact on the environment. While tourism is necessary as the driving force of Palau's economy, its benefits come with a price. The environment and infrastructure are burdened by the significant presence of tourism, and Palau cannot develop in a sustainable way without consciously directing policies that promote tourism while protecting the environment. These forces are often at odds with one another, and the House of Delegates is interested in pursuing a ministry level position for environmental concerns so that the environment receives separate attention from that given to development and tourism. The House of Delegates recognizes that Palau needs a balanced approach to tourism development and environmental preservation – one that produces sustainability in each arena. In the Ninth Olbiil Era Kelulau, the House has taken significant steps to promote sustainability by (1) directing tourism revenue towards conservation and infrastructure; and (2) proactively pursuing funding sources that will honor Palau's vision of sustainability.

One of the best examples of using tourism revenue to preserve the environment and offset the negative impacts that high-volume tourism creates is the Green Fee. Under that law, the national government collects the Fee from departing tourists and other non-Palauans and directed to state Protected Area Network (PAN) sites and infrastructure improvement projects. This money represents a great deal of revenue for the Republic, and its direction towards environmental preservation is evidence of the prioritization of the environment among issues of national importance. The House is highly in favor of initiatives like PAN sites because they promote bilateral cooperation between the national government and the states in pursuit of a common goal. The national government's policy of environmental preservation is directed to the states, and the states in turn choose the location and manner of site protection using the funds secured by the national government. The Green Fee promotes sustainability by converting tourism revenue into conservation efforts.

The House also recognizes that the revenue potential from departing tourist fees may be of even greater benefit to the Republic. The Palau National Marine Sanctuary (PNMS) Act presented an opportunity to increase revenue potential by creating an environmental impact fee (EIF) that would utilize the green fee concept to generate revenue for other national priorities. The PNMS became law through RPPL 9-49 and the process of implementation is currently underway. The EIF, once implemented, will support the Fisheries Protection Trust Fund, state governments, the Civil Service Pension Plan, PAN sites, infrastructure improvements, and the national treasury. The House is sensitive to the balance that must be struck between the tourist's threshold for capital expenditure and the Republic's tourism-based revenue potential, but believes that the EIF sustainably uses tourism, the very mechanism that participates in environmental degradation and infrastructure strain, to protect our great island nation.

The House is cognizant of the importance of collaboration not only among internal stakeholders but also the larger international community. Issues like marine protection and climate change are global in scope and the resources of the world must be directly broadly to address these concerns. Therefore, the House believes that our leadership must be proactive and deliberate in securing funding from developed countries or international organizations in order to achieve our goals of sustainability. House Joint Resolution No. 9-128-27S is an example of the proactive and creative approach to securing funding. In it, the House advocates for collaboration with The Nature Conservancy to participate in a program called Debt-for-Nature Swap. The House is in full support of this measure to address Palau's national debt while allowing the Republic to invest in its existing conservation and climate change adaptation efforts. The Nature Conservancy has used this program worldwide to partner with third parties interested in preserving some of the most beautiful and vulnerable places in the world through debt reprogramming. The Senate received this resolution in June, 2016 but has not acted upon it.

Another example of proactive funding acquisition is a recent partnership with the Government of Sweden that the House endorsed. House Joint Resolution No. 9-126-14 welcomed the Deputy Prime Minister of Sweden to the Republic of Palau and opened the door to future discussions wherein the Swedish government would collaborate with the Republic in areas of environmental conservation, expansion of the use of renewable energy, and implementation of sustainable development goals relating to the ocean. These House led initiatives support Palau's sustainable development by expanding our resources and capacity through partnership. The House believes in the vision of the Republic for a sustainable tourism industry and environment and seeks out opportunities for international cooperation.

Conclusion

Over the course of the Ninth *Olbiil Era Kelulau*, the House of Delegates has been responsive to the expressed concerns of stakeholders in the area of food security, infrastructure improvement, and environmental preservation in light of the high demands of a tourism-based economy. Our democratic way of life requires the cooperation of many individuals in order to produce sound policies that will meet our goals; therefore, the House welcomes opportunities for discourse such as the National Environment Symposium and hopes the information shared brings Palau closer to realizing its vision of sustainability for its economy and its environment.

Support for the 1st National Environment Symposium and these Proceedings was provided by the

Global Environment Facility (GEF)

United Nations Development Program (UNDP)

Palau International Coral Reef Center

Ministry of Natural Resources, Environment, and Tourism

National Environmental Protection Council (NEPC)

in collaboration with

Rubekul Belau and the Palau Conservation Consortium

For more information please contact:
NEPC Secretariat
Ministry of Finance
PO Box 100
Koror, Palau 96940