#### I. Project Information:

Grant Number: NA16NOS4820069 Project Title: Expanding science-to-management frameworks for coral reef ecosystems across Micronesia Grantee: Micronesia Conservation Trust Principle Investigator: William Kostka Phone: 691.320.5670/8903 Email: director@ourmicronesia.org Award Amount: \$600,000 Award Period: 01 October 2016 to 31st December 2018 Period Covered by this Report: 01 October 2016 to 31st December 2018

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#### **II. Executive Summary:**

The Micronesia Conservation Trust (MCT) is pleased to provide its final progress report describing efforts achieved under this Cooperative Agreement (CA) for "Expanding Science-to-Management Frameworks for Coral Reef Ecosystems Across Micronesia" that was implemented between October 1st, 2016 and December 31st, 2018. Through the ongoing efforts of the NOAA Cooperative Agreement, sustained progress and tangible results continue to be achieved from the evolving science-to-management networks that support the regional work of the Micronesia Challenge.

The Micronesia Challenge represents a locally-driven conservation movement that was originated and perpetuated by the political leaders of Micronesia. The challenge is for jurisdictions to meet effective conservation thresholds across 30% of their marine resources and 20% of their terrestrial resources by 2020. The NOAA CA has advanced the Micronesia Challenge by enhancing local coral reef management and monitoring capacity in the Freely Associated States (FAS) of the Federated States of Micronesia (FSM), the Republic of the Marshall Islands (RMI) and the Republic of Palau (ROP). With the generous and sustained financial and technical assistance from NOAA and other donors, MCT and its partners are collecting data on ecosystem conditions, socioeconomic factors, and fisheries, and analyzing the results to produce concrete management recommendations.

Under this program, MCT and its partners continued to build and expand on the work conducted under prior NOAA CA's by continuing to use defendable biophysical and socioeconomic monitoring and evaluation protocols to collect,

#### **MCT's Partners**

- University of Guam Marine Lab (UOGML)
- Palau International Coral Reef Center (PICRC)
- **Chuuk Conservation Society** (CCS)
- Marshall Islands Marine • Resources Authority (MIMRA)
- Conservation Society of Pohnpei • (CSP)
- Kosrae Conservation and Safety • Organization (KCSO)
- Yap Community Action Program • (YapCAP)
- The Nature Conservancy (TNC)
- Locally Managed Marine Areas • (LMMA)
- Micronesians in Island Conservation (MIC)
- Pacific Islands Managed and Protected Areas Community (PIMPAC)

analyze, and translate coral reef and socioeconomic monitoring results to further strengthen the regional science-to-management network built over the last decade in support of the Micronesia Challenge. MCT and its partners have also supported improved fisheries management, built local capacity to implement and evaluate management strategies to responding to climate change impacts, and strengthened the management of protected areas and PANs in Palau, FSM, and RMI.

Highlights of accomplishments over the past two years include (but are not limited to):

- Endorsement and implementation of fisheries management plans in the Municipalities of Kitti and U in Pohnpei;
- The completion of the Micronesia Protected Areas Management Effectiveness (MPAME) Tool and User Guide updates • and subsequent trainings in all 4 states of the FSM;
- The establishment of a Fisheries Advisory Committee in Kosrae;
- The endorsement and implementation of the Palikir Marine Protected Area Management Plan in Pohnpei
- The use of University of Guam's Marine Lab continued sea cucumber research as part of the coral monitoring program to positively impact policy having direct impact on how sea cucumbers are managed in Pohnpei;
- The completion of six data analysis workshops (Chuuk, Yap, Kosrae, the Republic of the Marshall Islands and two in Pohnpei) by the University of Guam Marine Lab;
- The hiring of a Regional Socio-economic Monitoring (SEM) Mentor;
- The completion of the Socio-Economic Monitoring (SEM) Strategic Planning meeting;

- The successful implementation of eco-based climate adaptation projects in 8 communities across the region;
- The implementation of 10 community projects that increased the effective management of natural resources across the Micronesia region.

Using the National Oceanic and Atmospheric Administration (NOAA) grant as a foundation to support the continuing development of science, MCT also leveraged funds from other partners in parallel to this grant. These partnerships focus on detailed analysis within individual jurisdictions, and on developing complementary fisheries-dependent research to help assess and manage nearshore fisheries across Micronesia. These partnerships also focus on expanding necessary support for protected areas networks (including sustainable financing mechanisms) and improving protected area effectiveness. The funding partners supplementing this Cooperative Agreement are the David and Lucile Packard Foundation, the Margaret A. Cargill Foundation (MACF), and The Nature Conservancy (TNC).

#### **II.** Purpose:

#### A. Justification:

MCT and its partners designed this Program to benefit coral reef and other ecosystem management activities under the umbrella of the Micronesia Challenge. The Micronesia Challenge is the overarching framework for resource management in the region and is a top priority for the leaders of Micronesia. As described in this Section, this proposed Program supports and will hone existing regional and site-level management strategies.

#### B. Proposal Goals and Objectives:

The goals of this Program are:

- 1. Improve ecosystem management by continuing to support vibrant science-to-management networks that use coral reef, socioeconomic, and fisheries monitoring data to inform decision-making at all levels (community/local, national and regional) across the Micronesia Challenge jurisdictions;
- 2. Implement ecosystem-based community climate change adaptations and share lessons learned and successful management approaches;
- 3. Strengthen the management of Micronesia Challenge protected areas and PANs. To accomplish these goals MCT and its partners propose five objectives that also support five of the Objectives under CRCP's International Strategy that are listed below.

#### **III. Approach:**

As with past CA agreements, MCT and its partners negotiated and implemented sub-awards in accordance with MCT's proposal for this cooperative agreement. These implementing partners from the Micronesia jurisdictions, with support from Dr. Peter Houk of UOGML, utilized the standardized monitoring protocol and scored ecosystem conditions across monitoring sites in the FSM, the RMI, and the ROP. This monitoring framework dictates which sites are selected to be representative of each island, encompassing locations in no-take populations (see methods of paper "*The Micronesia Challenge: Assessing the Relative Contribution of Stressors on Coral Reefs to Facilitate Science-to-Management Feedback*"). The implementation of the monitoring activities incorporated data into a science-to-management network and provide actionable information to advance the goals of the Micronesia Challenge.

To achieve the goal of this project, MCT and its partners conducted activities under each of the following 5 objectives:

- Objective 1. In six jurisdictions in Micronesia, collect new coral reef monitoring data, continue to analyze and translate previously collected data, and share resulting specific management recommendations with resource managers in each jurisdiction
- Objective 2. Provide targeted training and support to build the capacity of the Micronesia Socio-economic Monitoring team to implement the Micronesia Socio-economic Monitoring Plan and collect new socio-economic data in at least two sites.
- Objective 3: For at least one jurisdiction, integrate existing fisheries, coral reef, and socioeconomic monitoring datasets

and provide recommendations for improved fisheries management and share the results across the region through science-to-management networks.

- Objective 4: In eight sites build community capacity to test, implement, and evaluate management strategies to respond to climate change impacts.
- Objective 5: Through at least fifteen locally-based projects, strengthen the management and effectiveness of protected areas and Micronesia Challenge PANs across the region.

The following summarizes the work and accomplishments of this grant under the objectives throughout this CA period as was reported in five previous progress reports.

Objective 1. In six jurisdictions in Micronesia, collect new coral reef monitoring data, continue to analyze and translate previously collected data, and share resulting specific management recommendations with resource managers in each jurisdiction:



Using the standardized Micronesia Challenge approach (as shown above in this diagram developed by Dr. Peter Houk of the UOGML), the coral reef monitoring teams in Yap, Chuuk, Pohnpei, Kosrae, RMI, and Palau continued to conduct regular monitoring (in partnership with University of Guam Marine Lab as needed), store data at the jurisdiction level and share data for input into a consolidated online database. This is part of a continued partnership with UOGML and the Palau International Coral Reef Center (PICRC) to analyze the data and share the results of the monitoring to inform natural resource managers, policy makers, and communities. The following is a summary of accomplishments, per jurisdiction, over the course of the grant period.

#### Pohnpei (Subgrantee: Conservation Society of Pohnpei):

*Project Team:* The Pohnpei Coral Reef Monitoring team (CRM) is comprised of the Conservation Society of Pohnpei (CSP), Pohnpei State Office of Fisheries and Aquaculture (OFA) and the Pohnpei State Department of Resource and Development's (DRM) Division of Natural Resources and Development's fisheries technician.

*Monitoring:* Coral reef monitoring occurred throughout the project period with the monitoring team completing two rounds of data collection (2017 and 2018) in the established 20 sites around Pohnpei using the Stationary Point Count method to quantify fish density and biomass. Similarly, an invertebrate count method was used to quantify macro-invertebrate diversity and

abundance throughout transects along with a photo quad to provide an overall benthic snapshot. Throughout this 2-year project, the Pohnpei CRM also conducted grouper spawning aggregation surveys (SPAGS) during full moon periods to monitor grouper spawning and aggregation. Finally, CSP conducted sediment monitoring and sample collection monthly from October 2017 to March 2018. Traps are taken to the CSP office for processing that involves a series of set protocols that aim to obtain the dry weight for each sediment sample.



The graph above (prepared by the Pohnpei Coral Reef Monitoring Team) shows the preliminary results of the data collected over a 4-year period (2014 to 2018) from both MPA and non MPA survey sites. Three different variables were considered: secondary marked by the red dotted line are the general surgeon fish species and smaller parrot species, tertiary marked by the green dotted line are the carnivorous species including snappers, emperors, and grouper and herbivores marked by a blue dotted represent the general parrot fish species. Most of the MPA's around Pohnpei have been improving over the years.

*Training/Data analysis:* In December 2016, Dr. Houk conducted a data analysis training in Pohnpei with the coral reef monitoring team. The focus of the analysis was to evaluate how the condition of the reefs has changed since coral reef monitoring began in 2012. Although the results indicated that there was overall improvement in the Marine Protected Areas (MPAs) as evidenced by the increased percentage in growth of Porites corals, it identified the need for recovery in Acropora and other corals. Coral reef visual monitoring showed improved results for grouper populations with a doubling in numbers counted for the Square Tail Grouper (Plectropomus areolatus) species, the Camouflage grouper (Epinephilus polyphigadion) and the brown marbled grouper (Epinephilus fuscogutattus) species. Analyzed data by UOGML was able to confirm the visual monitoring results.

The results of the data collected during the 2 years of the project provide a glimpse into the current status of coral reefs in Pohnpei. Clearly, many of the MPA's are effectively increasing the overall health of the coastal marine environment in Pohnpei. Analysis of the MC Measures indicators shows that overall, abundance and biodiversity in the MPAs continue to improve as a result of more effective management through community stewardship, supported by local and state governments as well as local NGO's. Still, there are a number of monitoring sites located within MPA boundaries and in the vicinity of major watersheds that record poor fish and invertebrate biomass and moderate diversity of corals. These findings will help CSP and its partners to focus more efforts in the areas identified as needing further support.

Science to Management Outcomes: Important science-to-management outcomes in Pohnpei during this project period include the amendment of the already established grouper seasonal ban legislation (this both extended the closure timeframe for grouper catch to 5 months from January to May and increased grouper species protected to include *all* species under the legislation). Moreover, results of coral reef monitoring data and analysis were used to inform the Kitti and U fisheries management plans that were endorsed in 2017, serving as models for municipal level fisheries management plans and used to inform a larger national fisheries management assessment for the FSM. Invertebrate data were immediately used to assess a situation in Pohnpei to show the negative effects of overharvesting sea cucumbers and contributed necessary scientific data to the establishment of a ban on sea cucumber harvesting in the state. CSP and partners also worked with the Sokehs community to develop the Palikir Marine Protected Area Management Plan that was endorsed in August 2018 by the Sokehs Municipal Government and its traditional leaders. The establishment of this plan and the priority actions selected for implementation were determined directly from the results of the ongoing data collection and analyses from this monitoring program.

*Education and Awareness:* Monitoring results in Pohnpei continue to inform presentations shared at meetings and workshops by all members of the monitoring team and their partners to government, partners and communities. The information presented during these outreach efforts are influencing management measures and work plans at the community, municipal, and state levels. Positive impacts from fisheries management workshops have led to an increased understanding of the coral reef system and influenced state and local government leaders in their executive and legislative decisions. In 2017, the project assisted a learning exchange between the Pohnpeian and Kosraean coral reef monitoring teams in Pohnpei. The Pohnpei CRM team trained members of the Kosrae team to return to Kosrae and implement the standardized monitoring protocol used across the region for the first time ensuring that all MC jurisdictions are now using the same monitoring protocol.

#### Kosrae (Subgrantee: Kosrae Conservation and Safety Organization):

*Project Team:* The Kosrae monitoring team includes the Kosrae Conservation and Safety Organization (KCSO), the Kosrae Island Resource Management Authority (KIRMA), and the Kosrae State Department of Resources and Economic Affairs – Division of Fisheries (DREA) (the team is pictured right).

*Monitoring:* In Kosrae, fish monitoring is conducted twice a year while coral reef monitoring is monitored once a year. The first coral and fish biological data collection by the project team was completed in February 2017. The second data collection focused on fish and was completed in September 2017. Further collection occurred in April and August of 2018.

Training/Data analysis: As is usual protocol, the fish monitoring



data were entered into excel spreadsheets while information about coral was entered into a local database. All data were then sent to the UOGML to be analyzed and compared to previous data, and then included in the MC regional database. In May 2018, after the data collection and analysis was complete, Dr. Houk presented the results back to Kosrae State and local leaders as well as other stakeholders in the form of the State of the Reef Presentation. Other awareness materials provided include brochures, graphs, and reports.

The long-time coral reef monitoring data in Kosrae has shown that within the MPA sites being monitored, fish populations are slowly increasing. It is however, important to note that this data is from only two MPA communities and is not a large enough sample to prove island-wide improvements. The Kosrae State of the Reef presentation from UOGML recommends an increase in the sizes of the existing MPAs in Kosrae and the development of outer reef MPAs. It is hoped that KCSO and its partners will work with more communities to establish such MPAs going forward. During Dr. Houk's week-long visit to Kosrae, initial dialogue began to establish a Fisheries Advisory Committee in Kosrae. Based on this work, the Kosrae Government agencies responsible for marine resources management have agreed to adopt the MC measures as their official protocol for marine ecosystem monitoring ensuring that Kosrae State now has a similar monitoring program to the rest of the region. During the implementation of this CA, the Kosrae Island Resource Management Authority (KIRMA) transitioned their monitoring program to the MC marine monitoring protocol at 8 new monitoring sites around Kosrae with the assistance of KCSO. This marks an important development for Kosrae's continued monitoring program as all sites are now being monitored using the same, and therefore comparable, indicators.

Science to Management Outcomes: During this project, KCSO conducted awareness activities in 5 communities (Utwe, Malem, Lelu, Tafunsak, and Walung), In Utwe, concerns were raised specific to management measures for rabbit fish at Utwe Biosphere Reserve. Based on monitoring data from this program and anecdotal evidence from community members, the community is now considering a ban of rabbit-fish fishing during spawning and aggregation periods. Moreover, in Tafunsak, where the team highlighted a documented increase in fish population within Kosrae state MPAs, community leaders began to push for enactment of a state law recognizing Tafunsak MPA as a state protected area. The Tafunsak community MPA bill was then introduced on the floor of the Kosrae state legislature in late September of 2017 and the bill passed on the second reading on October 2<sup>er</sup>, 2017. In November 2017, state law SL 11-126 amended Chapter 8 of Title 19 of the Kosrae State Code by adding a new section (19.825) to establish and codify the Tafunsak MPA.

*Education and Awareness:* An elementary school awareness program is one of the key activities of KCSO's Coral and Fish Monitoring program. During the first year of this CA, KCSO visited all six public elementary schools in Kosrae (Lelu, Malem, Utwe, Sansrik, Tafunsak and Walung) to share the results of monitoring surveys conducted in 2016. Approximately 150 students from all public elementary schools attended the presentations. The KCSO coral monitoring team shared information on types of fish that make up the market sales, shared information about why fish should not be caught before they can reproduce, and how important moon phases are to catch success. The team also shared information on changes in coral reef ecosystems through time. Information such as the decline of fish and coral health in recent decades, contributing factors, and recommendations as to what individuals can do to help improve the health of the coral reefs and fish stocks were also shared with the students. In other awareness sessions focusing on the health and well-being of the upland forests of Kosare, KCSO linked their message to coral

reef ecosystems by discussing they ways in which unsustainable activities on-land can harm fish and corals. KCSO also convened a meeting of all MPA managers in August 2017 to discuss progress and activities in their respective MPAs including sharing the results of the coral and fish monitoring to help these communities as they further identify management needs in their MPAs.

#### Yap (Yap Community Action Program):

*Project Team*: The Yap coral reef monitoring (CRM) team consists of Yap Community Action Program (YapCAP), Yap State Department of Resources and Development (R&D) and Yap Environment Protection Agency (EPA).

*Monitoring*: The Yap team collects biological data at 20 established sites around Yap once per year. The ongoing collection of biophysical monitoring data has enabled the team to begin looking into trends of fisheries with respect to MPA status and provide very positive reports on the continued improvement of the network on Yap. After a bleaching occurred in 2017, the Yap Community Action Program CRM team conducted a series of visits to 7 monitoring stations across Yap reefs (Af, Pelak Channel, Toruw, Rumong, Atliw and Reey reefs). At each site, the team sought to visually observe the bleaching effects on the reefs due to the extreme rise in ocean surface temperature. Coral bleaching was observed throughout the sites. Photographs were shared with Dr. Houk of UOG and used to develop two manuscripts on ENSO events across Micronesia (see Objective 3 for more information).

Training/Data analysis: In early November 2016, Dr. Houk and marine biology graduate student, Steven M. Johnson, visited Yap for a four-day data analysis workshop of biological data collected in May of the same year. The workshop consisted of five members of the YapCAP monitoring team, three members of the Tamil Resource Conservation Trust (TRCT) and one member of the Yap Fishing Authority. During the data workshop, the collected data from the monitoring sites in 2016 were compared with data from 2011, 2014 and 2015. The overall trend shows an increase in fish biomass at almost all MPA monitoring sites (see diagram to the right). Part of Dr. Houk's visit also focused on the introduction of a coastal fisheries study that was conducted on Yap from December 2017 to December 2018. The data collected from fish markets across Yap will be analyzed and used with the data collected by the coral reef monitoring team to inform Yap's management efforts. Moreover, in July 2017, Dr. Rob Van Woesik of the University of Florida visited Yap and conducted a 2-week workshop on Coral Taxonomy where the team increased their skills at identifying and collecting coral data. Collected data were then entered into the existing database and then shared with Dr. Peter Houk.



Change in fish biomass in Yap MPA's prepared by our collaborative data analysis working group, and part of the presentation provided to community members and leaders.

*Science to Management Outcomes:* In 2017, the CRM team, with the assistance of Javier Cuetos-Bueno, a fisheries researcher with the Nature Conservancy (TNC), met with community leaders of Tamil. The team presented on the state of Yap reefs, with emphasis on sites within Tamil's protected marine habitats. Inspired by the presentation and the data presented, the group then engaged in discussions to begin to identify better management actions to protect their marine habitats. Also, in 2017 a new partnership was established by the CRM with the community of Rumung, the northern-most municipality of Yap. Having attended presentations from the CRM and its partners, the community who had yet to be engaged in coral reef management planning requested assistance to establish a protected area. After the presentations, the group then engaged in lengthy discussions about what they could do as a community to protect and better manage their marine resources for generations to come.

*Education and Awareness:* During the 2016 data analysis workshop led by Dr. Houk, a PowerPoint presentation was put together by the participants of the workshop and presented to the Locally Managed Area Network (LMAN) as well as other relevant stakeholders. The LMAN is a group of practitioners involved in various conservation projects in Yap. The LMAN then disseminated information to their community members, especially the communities with marine monitoring sites. The LMAN shared the results of the workshop through the PowerPoint presentation to community groups throughout the project period. Outreach and educational activities during this project period took place concurrently with the recruitment and training of community representatives who were hired by YapCAP to support the coral reef monitoring work. The selection process targeted the 10 municipalities on Yaps main island. Over the period of this contract, several trainings and workshops were conducted by

the UOGML scientists in collaboration with these community stakeholders to educate and share the results of the coral reef monitoring project with the wider community. School visits and presentations were also conducted, including visits to the Yap Main Island High School regarding the coral reef monitoring objectives, results, status and the importance of protecting the sustainability of fisheries resources. As well, an informative presentation by the Yap monitoring team was conducted at Yap Catholic High School (YCHS) where the team shared the presentation on Yap's Reef Status; (same presentation shared with LMAN).

#### Chuuk (Conservation Society of Chuuk):

*Project Team*: The Chuuk monitoring team includes the Chuuk Department of Marine Resources (DMR) and the Chuuk Conservation Society (CCS).

*Monitoring*: While capacity and weather issues caused delays for the Chuuk monitoring teams during this project period, the team conducted monitoring at a total of 8 sites in 2017 and all 19 long-term monitoring sites in 2018. In 2017 CCS worked with Dr. Houk of UOG when he visited Chuuk to check the severity of a recent bleaching event (more information on this under Objective 3).

*Training/Data analysis:* The data collected during 2018 proved essential to documenting the impacts from the recent ENSO (El Niño/Southern Oscillation) coral bleaching event and Crown-of-Thorn starfish outbreaks across Micronesia. Among all the jurisdictions in Micronesia, Chuuk was especially impacted by the bleaching event. The magnitude of the recent ENSO events across Micronesia are being formally documented and UOG is preparing a localized manuscript that will describe recommendations to improve overall predictions of these events into the future. This manuscript and associated outreach materials will form the basis for outreach activities in Chuuk and the rest of the jurisdictions in the next CA. More information on analyzed results are described under Objective 3 below.

*Science to Management Outcomes:* In 2017, fishermen began to be more interested about coral reef monitoring sites and requested that the team expand their outreach throughout the Chuuk Lagoon and outer islands. This interest took added momentum from the newly passed Chuuk State Coastal Fisheries Protection Act. Lessons learned from this NOAA supported coral reef monitoring project contributed to the formulation and interest in the bill. At present, there is widespread attention to coral reef and fisheries issues in Chuuk. The monitoring team takes a central role in advocacy with policy makers as well as responding to stakeholders' inquiries. On February 15\*, 2017, a meeting occurred at Nukuno Village on Tonoas Island with the Nukuno Conservation Organization (NCO). Inspired by findings supported through the on-going coral reef monitoring project, the NCO identified coral reef protection as one of their main concerns.



Above: Photographs of same site: in 2012 (left, living Acropora stands) and in 2018 (right, dead Acropora skeletons) on Puwe patch reef in Chuuk depicting the impacts from the recent bleaching events. 95% of living coral loss was documented.

*Education and Awareness:* In September 2016, after deploying a fishing aggregate device (FAD) at the westward side of Fanip village, Fefen Island, staff from CCS and Chuuk State Department of Marine Resources spent time at the nearby village to share

general information on the current trends in coral reef status and deterioration throughout Chuuk as shown by reef monitoring data. In this context, community members were sensitized to the need to allow recovery time to the reef, to which the FAD is expected to provide relief as an alternative fishing site in the long term. CCS and DMR staff also visited Saramen Chuuk Academy to share about their Fisheries campaign and NOAA coral reef outreach. Reading materials compiled by CCS were also left at the school for the teachers to use in their classes. Staff also visited the Wichukuno Village and Tol Island. The communities are very keen on working to conserve their mangroves and have received assistance in the past to help guide the community for the planning and development of an MPA site. This visit also included awareness on the Fisheries Campaign and coral bleaching awareness and staff from DMR and CCS shared long-term findings on conditions of Chuuk's reefs (State of the Reef) and shared general findings regarding biodata and fish-population status throughout Chuuk lagoon.

A highlight of the ongoing outreach and awareness program occurred on September 15, 2017 at the Chuuk High School Campus. The school held a campus-wide career day, inviting several government and non-government entities to inform students on career paths and post-secondary education most relevant to Micronesian communities. Over 500 students took advantage of the opportunity to engage with future employers. CCS stressed Chuuk's need to develop skilled and highly-educated natural resource managers. As concrete examples, CCS discussed the coral reef monitoring program over the years and the importance of involving reef owners, fishers, scientists, policy makers, research institutions, governments, civil organizations, regional networking entities, and global support institutions.

#### Marshall Islands (Marshall Islands Marine Resources Authority):

*Project Team*: While the subgrantee for this CA was originally approved as the College of the Marshall Islands (CMI), at the request of the jurisdiction, MCT submitted an award action request to NOAA in October 2016 to change the sub-awardee contract from CMI to the Marshall Islands Marine Resource Authority (MIMRA). The request was subsequently granted.

*Monitoring*: In July and August 2017, MIMRA conducted marine baseline surveys in 5 new atolls under the Reimaanlok conservation approach in support of the Micronesia Challenge. These atolls are: Aur, Maloelap, Wotje, Mejit, and Utrok. Data collected included fish assemblages, invertebrate, and benthic cover, all of which were uploaded onto the MC Regional Database at UOGML. In July of 2018, the RMI coral reef monitoring team led by MIMRA conducted its regular coral reef monitoring in collaboration with the Secretariat of the Pacific Community (SPC). Over approximately 15 days, five locations were covered on the Majuro Atoll. Some highlights of the analysis were presented by Dr. Houk and the RMI Monitoring Team at their 1st National Ocean Symposium (NOS) in Majuro from the 3<sup>st</sup> to the 5<sup>st</sup> of April 2017. The presentation shared information analyzed and gathered from the long-term program including such findings as: atoll size is the strongest predictor of how many species exist on each atoll in the Marshall Islands (the bigger the atoll, the more species are found there), there is a direct correlation between atoll population and food fish biomass availability (see diagram below showing a the situation in Majuro Atoll) and that overall health of the coral reef ecosystems in the Marshall Islands are directly related to fishing pressure proxy (also see diagrams below developed by Dr. Houk of UOG).



*Training/Data analysis:* In early 2017, following the ongoing coral reef monitoring surveys, MIMRA undertook statistical data analysis training in order to analyze data efficiently before presenting back to the communities on the state of their reefs. Dr. Houk and MIMRA completed data analysis to support RMI's inaugural National Ocean Symposium (NOS) held in Majuro in April of 2017. In 2018, RMI MIMRA coral reef monitoring team members in "R-training" (a programming software used for

statistical analysis) sessions aimed at increasing the capacity of interested MIMRA employees to lead in-depth analysis of collected data on the ground in the Marshall Islands. Moreover, data collected on Ebon and Maloelap atolls (monitoring not funded by this project) were prepared, transposed, and used during the R-training sessions. This data is now ready to be used to inform each of the respective atolls' management plans.



R-Training sessions for MIMRA staff at the Ministry of Natural Resources and Commerce

Science to Management Outcomes: As was reported above, the summary of coral reef monitoring and analysis was shared at the NOS and in turn, used to develop National Guiding Principles to Sustain and be Sustained by Our Ocean and Coral Reefs stem from the National Oceans Governance Vision. Moreover, through the work of the Reimaanlok process, all coral reef monitoring data is analyzed and then shared back to communities and incorporated into community fisheries and management plans.

Education and Awareness: At the National Ocean Symposium (NOS) held in Majuro, the data analysis and summary presentations were provided to the President of RMI and political officials from all of the atolls and community members. The main objective of the NOS was for the municipal atoll and national leadership to develop an Ocean and Coral Reef Policy Framework for the Republic of the Marshall Islands. Per the NOS Executive Summary: the outcomes of the NOS include The National Guiding Principles to Sustain and be Sustained by Our Ocean and Coral Reefs which stems from the National Oceans Governance Vision: "As a large ocean nation with a rich history in sustaining and being sustained by the resources of the sea, we commit to ensuring that our resilience in the face of global oceans challenges endures for generations to come." The Guiding Principles provide a set of policy directives to the national government to steer its activities at the national and local government levels as well as communicate the RMI's priorities and activities at the international level. One key purpose of the Guiding Principles served as RMI's national submission of voluntary commitments to the United Nations Ocean Conference in June 2017.

#### Palau (Palau International Coral Reef Center):

Project Team: Palau International Coral Reef Center (PICRC).

*Monitoring*: Coral reef monitoring at 23 PICRC permanent monitoring sites was completed in the first half of each year with data having been entered, backed up and analyzed. In October 2017, Tropical storm Lan generated 5m+ swells on the west facing reefs of Palau. Extra benthic surveys were conducted at 6 long term monitoring sites in the damaged habitat to assess the damages from this disturbance.

*Training/Data analysis:* PICRC shared and uploaded long-term coral reef monitoring data from 2002, 2003, 2005, 2007, 2010, 2013 and 2014 on to the MC database as these data have already been published. Remaining years for this dataset (2009, 2016)

will be uploaded once the manuscript is accepted for publication. All other ecological data (MPAs and seagrass beds) will be uploaded once they are published in peer-reviewed journals.

*Science to Management Outcomes:* PICRC's long term coral reef monitoring program and resulting publications have been shared widely with government and community throughout Palau. Publications on results and best practices continue to be used for updating management plans and practice in MPA sites across the Palau PAN network.

*Education and Awareness:* During the time period of this project period, PICRC developed a number of technical reports and periodical pieces for journals. Technical report 17-01, entitled: "15 years of coral reef monitoring demonstrates the resilience of Palau's coral reefs" has been produced and is available. Baseline data collected at PAN MPA sites has been used in the technical report (16-06) entitled "Ecological conditions of coral-reef and seagrass marine protected areas in Palau". In July 2017,



the results of the reports were presented to members of Palau's National Congress at PICRC. A presentation was also made to partner agency, Palau Conservation Office. Copies of the CRM Technical Report were provided to all State Governments; National Government Office - Ministry of Natural Resources, Environment and Tourism; Protected Areas Network Office (PAN O); PAN Fund; and other partners locally. Moreover, PICRC has developed and finalized three additional technical reports on MPAs and one on coral reef monitoring with a number of other reports still being developed as follows (all can be found at picre@picrc.org):

- Marino L, Gouezo M, Dochez M, Nestor V, Jonathan R, Mereb G, Olsudong D. 2018 Ecological Assessment of Ngermedellim Marine Sanctuary. PICRC Technical report 18-09 Palau International Coral Reef Center. Koror, Palau
- Gouezo M, Nestor V, Dochez M, Jonathan R, Marino L, Olsudong D, Mereb G. 2018 Status of seagrasses fishes and macro-invertebrates at Teluleu Conservation Area from 2011 to 2018. PICRC Technical report 18-13 Palau International Coral Reef Center. Koror, Palau
- Marino L, Gouezo M, Dochez M, Nestor V, Jonathan R, Mereb G, Olsudong D, Parker A. 2018. Ecological assessment of Iuaiu Conservation Area in Angaur State. PICRC Technical report 18-18 Palau International Coral Reef Center. Koror, Palau

## Objective 2. Provide targeted training and support to build the capacity of the Micronesia Socio-economic Monitoring team to implement the Micronesia Socio-economic Monitoring Plan and collect new socio-economic data in at least two sites:

SEM Program Development: For many years, work for socio economic monitoring (SEM) in the region was led by the Micronesia Islands Nature Alliance (MINA) in Saipan, Commonwealth of the Northern Marianas (CNMI) through the work of two consecutive SEM leads. In 2017, half way through year one of this CA, the key individual responsible for socio-economic monitoring left his position at MINA. Knowing that MINA would not have the capacity to implement SEM work going forward, the Director of MINA requested that the subcontract with MCT be terminated to ensure that the work could continue. At the same time, MCT received funds from the U.S. Department of Interior to hire a full time SEM Mentor. The request from MINA, paired with the new SEM Mentor position, led MCT to request a termination of sub-contract with MINA to NOAA so that the new Mentor would be able to continue the work under this grant through MCT. The request was subsequently approved by NOAA.



Regional SEM Mentor Mr. Winfred Mudong shares SEM survey results at a community meeting in Weloy, Yap.

On January 22<sup>nd</sup>, 2018 MCT, Pacific Islands Marine Protected Areas Community (PIMPAC) and the Micronesia Challenge Regional

Office (MCRO) welcomed its new team member, Mr. Winfred Mudong of Pohnpei, as the new SEM Mentor. Mr. Mudong is based at MCT in Pohnpei, as a consultant and is under the supervision of the MCRO. Mr. Mudong continues to coordinate socioeconomic monitoring activities for the Micronesia Challenge and PIMPAC across the region.

**SEM Training and Capacity Building**: During the first half of 2018, the SEM Mentor visited Yap, Kosrae, Palau, Guam, and Saipan where he conducted personnel training capacity assessments with all available SEM core team members. He conducted over 40 individual interviews with core team members using the PIMPAC capacity assessment matrix. This data is being used by the SEM Mentor and PIMPAC advisors to prioritize core team training needs to continue SEM capacity building within the region.

In August of 2018, the SEM Mentor conducted a strategic planning meeting and SEM-Pasifika training in Pohnpei, FSM. Fifteen SEM core members attended the workshop. During the planning exercise, each SEM core team member provided an update on all SEM activities completed in their jurisdictions and pitched their draft future SEM proposals. Together, the group completed the SEM data management plan (previously submitted) and updated the SEM monitoring plan (previously submitted).

The SEM-Pasifika training was also a success. For those already seasoned SEM core members, the training was an opportunity to refresh capacity and help support the newer members of the team who were learning about SEM surveys for the first time.

One of the main objectives of the SEM-Pasifika training was to increase the regional SEM core team capacity. All the SEM core members were selected by their individual organizations and endorsed by their regional MC focal point. Each member has his/her own primary responsibilities and many more additional duties including the implementation of SEM activities in their jurisdictions. Approximately half of those who participated in the strategic planning meeting and SEM-Pasifika training had no prior experience with the SEM-Pasifika guide nor with any SEM assessments. This is due to the regrettably high turnover of staff over the past few years. Fortunately, through this training, these individuals now have more confidence in their work as SEM core team members. In fact, a post training assessment indicated that 100% of the training participants are now capable of planning and conducting SEM assessments within their own jurisdictions and are competent enough to provide SEM assessment support anywhere in Micronesia.

SEM training workshops built and increased capacity in socioeconomic monitoring through an introduction to the SEM-Pasifika purpose, tools, and processes and how to use them to design and conduct a socioeconomic assessment. They also provide an increased understanding of good indicators and introduced to the indicators in the SEM-Pasifika guidebook. Participants then join in hands-on exercises to use the guidebook and small group exercises to develop assessment objectives that address management objectives. The trainees receive overviews of the primary data collecting methods, including survey, key informant interviewing and focus group discussions. Participants developed survey and interview questions during exercises, conducted a household survey practice and interviewed the staff of organizations and agencies involved in fisheries conservation and management in the survey area. Overall, they gain first-hand experience in translating a survey questionnaire and pretesting it. The training increased the capacity of participants as enumerators for surveys of those who attended and introduced the differences between qualitative and quantitative data.

#### SEM Data Collection/Surveys: Throughout this project period, 3 SEM surveys were conducted as follows:

*Oneisom, Chuuk:* From April  $17^{th} - 28^{th}$ , 2017, MCT's then key socio-economic monitoring partner, MINA conducted a Socioeconomic Monitoring (SEM-P) training in Chuuk, FSM followed by a household survey in the municipality of Oneisomw. The Chuuk Conservation Society (CCS) assisted in coordination and logistics, along with the Chuuk Women's Council. The training team consisted of Supin Wongbusarakum from the University of Hawaii Joint Institute of Marine and Atmospheric Research/US National Oceanice and Atmospheric Administration, Kodep Ogumoro---Uludong formerly of the Micronesia Islands Nature Alliance (MINA) and Rachael Nash of the Micronesia Challenge Regional Office.

*Weloy, Yap:* From February 25<sup>th</sup> to March 25<sup>th</sup>, 2018, the SEM Mentor along with Mr. Magmay Magmay (enumerator team leader), Berna Gorong (TNC/Community leader), and Bertha Reyuw (MCT supported intern) collected SEM surveys, input data and conducted the analysis. Meghan Gombos of PIMPAC joined the team in the 3rd week and helped facilitate a workshop with the Weloy SEM core team to present the SEM assessment initial results to the Weloy community. They also conducted a separate workshop that included the Nimpal core team members using the results of the Weloy SEM assessment to update the Nimpal Channel Marine Conservation Area management plan. The recommended updates to the plan were presented to the community council members for feedback. Without any objection and with complete support from the community and the council members, the Nimpal core team moved forward with updating the Nimpal MCA management plan.

Nahtik (Woun Kepin Saomwoai WKS), Pohnpei: In November and December of 2018, the Pohnpei Socioeconomic Monitoring team, led by the SEM Mentor conducted a SEM assessment in WKS. Out of the total 159 households in the community, 141 households participated in the survey. The number of participating households was extremely high due to strong support from the community members and its leadership. During the WKS community consultation conducted by the Pohnpei SEM-core team in August 2018, the participants selected six community members to support the Nahtik socioeconomic assessment as enumerators. From November 3<sup>rd</sup> to 7th, 2018, social scientist and socioeconomic advisor Dr. Supin Wongbusarakum (NOAA) led the SEM-Pasifika overview and enumerator training. During this workshop, the enumerators supported the Pohnpei SEM core team to translate the final assessment questionnaire, ran a pre-test on the questionnaire and finalized the WKS socioeconomic assessment tool.

Reports for all 3 surveys have been previously submitted. Use of the reports' analyses will be integrated into management plans and shared with communities to influence adaptive



SEM assessment survey field testing for Nahtik MPA (Woun Kepin Saomwoai) survey in Pohnpei

management of protected areas, fisheries and livelihoods projects throughout the region.

**SEM Outcomes/Documents/Achievements:** A number of important contributions to the overall SEM program for the region were achieved during this project period. They include: 1. Completion of a region-wide SEM-P training, 2. Finalization of the SEM Monitoring Plan, 3. Establishment of the SEM Data Management Plan, 4. Finalization of PIMPAC Capacity Assessment, 5. Draft peer review article for Weloy SEM Survey Results. All documents have been submitted with previous progress reports.

## Objective 3. For at least one jurisdiction, integrate existing fisheries, coral reef, and socioeconomic monitoring datasets and provide recommendations for improved fisheries management and share the results across the region through science-to-management networks

This objective was led by Dr. Peter Houk of the University of Guam Marine Lab (UOGML) to further support fisheries management, MCT and its partners worked to integrate coral reef monitoring datasets with fisheries dependent datasets to assess how shifting fish stocks impact overall ecosystem conditions, and to target what aspects of the fishery need improving. This analysis was shared through the Micronesia Challenge science-to-management and peer-learning networks and on the ground training and workshop opportunities to inform ecosystem-based approaches to fisheries management throughout the region.

#### Data Analysis/Capacity Building Workshops:

<u>Pohnpei, December 2016</u>: Dr. Peter Houk conducted a data analysis training in Pohnpei with the coral reef monitoring team. The focus of the training was to evaluate and learn to analyze how the condition of the reefs has changed since coral reef monitoring began in Pohnpei 2012.

<u>Yap November 2017</u>: Dr. Houk worked with partners in Yap to ensure that all 2016 data were updated in the MC regional database. Once completed, Dr. Houk and the Yap monitoring team continued their long-term data analysis efforts. The results of the analysis provided significant indication that the MPA network is resulting in an improvement of ecosystem conditions.

<u>Pohnpei December 2017</u>: Dr. Houk held a workshop in Pohnpei focused on evaluating the condition of the reefs since the influential outbreak of Crown-of-Thorns starfish in 2009. Following this natural disturbance, Dr. Houk and the CRM team in Pohnpei utilized the monitoring data collected since 2012 to continue observing a stronger recovery of Porites corals compared with Acropora and others that form essential habitat structure on reefs. The team also observed relationships between mean fish sizes and the recovery of these habitat forming corals.

Kosrae February 2018: Dr. Houk supported data collection with the Kosrae monitoring team. Monitoring occurred across a suite of permanent sites around the island and revealed impacts from a recent high-temperature induced bleaching event. The results from the surveys were immediately translated into outreach materials published in the local newspaper. These results have also been integrated into ongoing fisheries management workshops within the local communities.

<u>Marshall Islands March 2018</u>: Dr. Houk supported data collection with the Marshall Islands monitoring team where a significant effort was made to collect data in support of their long-term outer-atoll resource management program. This included collecting a suite of data across (5) atolls: Aur, Maloelap, Wotje, Utrik, and Mejit.

<u>Chuuk, March 2018:</u> UOG visited 4 monitoring sites in Chuuk to check the severity of a bleaching that was ongoing at the time of the monitoring. Based upon these results, UOG modified its spring/summer monitoring plans for increased monitoring in Chuuk and have received additional funding from MCT to augment their coverage during this critical timeframe.

**Coastal Fisheries Management Plans:** During this project period, MCT and its partners were implementing a project *Supporting more effective natural resource management in Micronesia*, which two of its objectives are complementary to the goals of the Cooperative Agreement. This project had two funding sources, the David and Lucile Packard Foundation and Margaret A. Cargill Foundation. One of the objectives of the project was to design a comprehensive Federated States of Micronesia (FSM) coastal fisheries management plan by working at the National and State-levels. Early in the project, the FSM national government also received a grant from the World Bank to develop a national coastal fisheries management plan. To avoid duplicating that effort, MCT and its partners took a bottom-up approach by facilitating the development municipal plans that will in turn inform and feed into the national plan.

With assistance from MCT and its local partner, the Conservation Society of Pohnpei (CSP), and with technical assistance from RARE, The Nature Conservancy (TNC), Dr. Peter Houk of the University of Guam's Marine Lab, Dr. Kevin Rhodes of the University of Hawaii Hilo, and others, the municipalities of U and Kitti in Pohnpei developed fisheries management plans that

were endorsed in 2017. The development of municipal plans by these two communities not only represented critical milestones towards improving and strengthening local natural resource management but has also provided important guidance for and input to the development of the National Management Plan. One important lesson learned by both municipalities is that they require additional staff to implement the municipalities' objectives. Therefore, both municipal governments have revamped their organizational structures to create permanent position for a Natural Resource Management Coordinator (NRMC) to spearhead conservation and management efforts and be responsible for leading implementation of the plans

**Research and Impact Highlights:** A highlight of this project period was the detailed and integrative analysis of Yap's fisheries and social system structure that was completed and published as a UOG MS thesis. This work focused on understanding what aspects of social structure have led to conservation success over the past 7 years of coral reef monitoring. The work revealed the novel insight that social cohesion, rather than top-down leadership was the strongest predictor of conservation success. Importantly, the results were extended to recommend novel approaches to fisheries management such as increasing access for social forms of fishing, and restricting access for individual forms of fishing. These concepts became the subject of outreach to Yap's communities over the remaining project period and will be integrated into community-based management, as communities own and ultimately dictate how resources are exploited in Yap.

In the beginning of 2018, UOG focused efforts on assessing the severity of the 2016 and 2017 coral bleaching events across Micronesia due to the increasing importance of understanding disturbance cycles on Micronesia reefs and how reef systems and fisheries can best be managed to prepare for further climate-induced disturbances. While the people of Micronesia do not have control over climate change, they do have control over local stressors such as fisheries that can influence the time it takes for reefs to recover. Sea-surface temperate data were processed by UOG graduate students and Dr. Houk by downloading and summarizing satellite-derived temperature data to depict the recent high-temperature disturbances. UOG found that both 2016 and 2017 were significant disturbance years, and the degree of impact differed between the islands. Most importantly, UOG also documented how fish assemblages contribute to resilience and recovery, to best inform evolving policy. Healthy fish assemblage support both resistance and recovery, but the extent to which each species or functional group of fishes contribute is poorly understood and the subject of their further study.

UOG also participated in the inaugural Kosrae fisheries advisory council meeting. The first local meeting held in Kosrae to support the establishment of a community-driven process to improve fisheries (primarily) and pollution (secondarily) management. Data analysis from the overall coral monitoring program was used to provide the group with an updated state of the reef presentation which informed a discussion for potential management strategies. The success of this initial meeting was attributed to the governmental/non-governmental/community group formalizing the board for the emerging council. Positions within the council have since been elected and a mission statement formalized.

Of particular interest during this project period was UOGML's continued sea cucumber research to have direct impact on how sea cucumbers are managed in Pohnpei, FSM. In recent years there has been much debate regarding the status and trends in sea cucumber populations, and whether or not harvest should be open. The 2017 and 2018 data both revealed substantial and persistent declines in sea cucumbers that are likely attributed to illegal harvesting in Pohnpei. Further, harvesting appeared to take place in both MPA and non-MPA areas. These data were shared with NGOs and governments in Pohnpei (and elsewhere) with the hope of influencing policy and enforcement to protect sea cucumbers from dangerously high harvest levels.



Above: Trends in sea cucumbers across lagoon reefs in Pohnpei between 2015 and 2017 (Figure from Dr. Houk, UOG)

### Objective 4. In eight sites build community capacity to test, implement, and evaluate management strategies to respond to climate change impacts:

As the International Climate Initiative Project (ICI Project) implemented by MCT during this CA project period directly complimented the goals of the NOAA coral reef monitoring project, this work represents a portion of MCT's matching requirements under this grant. Under this subcontract between The Nature Conservancy (TNC) and the Micronesia Conservation Trust (MCT) for the Building the Resilience of Communities and their Ecosystems to the Impacts of Climate Change in Micronesia and Melanesia project, MCT and its partners implemented climate adaptation projects across the region. This project began on the 8<sup>a</sup> April 2015 and completed on 30<sup>a</sup>April 2018. For the project, MCT engaged local partner organizations as subcontractors to implement community-based climate change vulnerability assessments, management planning, and other actions to improve community resilience to the impacts of climate change in 8 sites across the region.

These projects were implemented through sub grants from MCT to the following conservation NGO's: The Marshall Islands Conservation Society (MICS), KCSO, CSP, YapCAP, the Melekeok Local Government (MSG) and the Palau Conservation Society (PCS). By the end of the project, communities in each of the eight target sites had measurably improved their adaptive capacity and had taken specific, locally relevant actions to help reduce their vulnerability to climate change impacts. These communities demonstrated progress, and lessons learned have been shared island neighbors and counterparts at local, national, and regional levels. MCT provided the target countries with strategic direction and guidance regarding sustainable financing and related policy recommendations for climate adaptation at the national level. Moreover, lessons learned have been identified and shared, and management plans were adapted accordingly. A summary of project outcomes for each site follows below.

#### Wotho Atoll, Republic of the Marshall Islands (RMI): Marshall Islands Conservation Society (MICS)

Through the BMUB Project, MICS conducted numerous community outreach and planning activities on Wotto through community workshops. A Local Resource Committee (LRC) was formed to help organize the community for outreach and planning activities, guide the project and lead future initiatives. The result of the community consultations is the first adaptation plan developed for Wotto Atoll. Based on community input during the outreach and planning workshops, the three natural resource targets for local early vulnerability assessment and adaptation planning were identified. They are: 1) marine environment, 2) food crops and 3) shoreline ecosystems and natural coastal barriers. A social target (i.e. households) was also identified. Following further consultations and engagement activities with the community it was decided that the project would take a true socio-ecological approach and focus on improving the resilience of marine resources and the community by improving protection and management of marine resources to support a sustainable fishery. This approach would both aim to improve marine resource health and resilience while also stabilizing livelihoods, optimizing economic benefits, and realizing a stable

supply of seafood for the community and outside consumers on the nearby highly populated island of Ebeye. The goal of this project was to increase community resilience through enhanced capacity for sustainable fisheries and access to social networks. The actions implemented under this project to support this goal were an analysis of biological and social data to create three reports to support the community to establish a sustainable fishery for Wotto atoll thereby establishing a sustainable and reliable transportation route between Wotto and Kwajalein and improve benthic data analysis.

#### Mejit Island, RMI: Marshall Islands Conservation Society (MICS)

Through the Project, MICS conducted numerous community outreach and planning activities through community surveys and workshops. Based on community input during these activities, concerns over climate change and adequate food supply were identified. Water security was also identified as a threat; however less so because of a series of recent grant-funded projects to expand the community's water storage and reverse osmosis capacities. As part of the outreach and engagement activities, MICS also facilitated a participatory flood mapping exercise with Mejit residents (with an emphasis on the local chapter of the WUTMI). Mapping was completed following a coastal flooding event and as a result, the community identified terrestrial resources as a project focal area for BMUB. Further detailed adaptation planning ensued, and the community identified the following goal — *increase community resilience through enhanced food security and coastal protection*. The following results were achieved:

- *Coastal protected area* the community has agreed on draft boundaries that place roughly one-quarter of Mejit island into a coastal land protected area. The development of a clear list of rules for the area is currently underway. Upon finalizing the boundaries and rules MICS will help support the development of signage and a community billboard to ensure boundaries and rules are understood. MICS will also support the community, local government, and senators to develop an ordinance with the intention of the site becoming part of the RMI Protected Area Network (PAN).
- *Food tree planting* the local women's group planted 150 trees of a local variety of breadfruit in areas less vulnerable to flooding events. Toward the end of the project, assistance was provided by the College of Marshall Islands (CMI) to check on the health of the trees and support the planting of new trees to replace the unhealthy or senile ones. A report from CMI and the women's group noted that 65% (96 out of 150) of the trees planted through this project remained healthy at the end of the project. Unhealthy trees were replanted and technical assistance on composting to support tree health was provided. All trees were geo-tagged to identify their precise location. This resulted in three maps: 1) sites of older, mature breadfruit trees, 2) sites of new breadfruit tress, and 3) combined sites older and new breadfruit trees. The community also held a breadfruit festival to celebrate the successful completion of their goals and actions of the project. The festival was attended by the entire community and served as an opportunity for further awareness raising. This project has further increased the community knowledge regarding access and use of their own resources by learning how to use local breadfruits to develop seedlings.
- Sustainable piggery pilot project The community collectively decided which families would pilot the two now completed dry litter piggeries. Fuel was also provided for a wood chipper to supply the piggeries with the wood-chips necessary. Additional funds from Global Green Fund (GGF) will provide support for another six to eight piggeries.

#### Malem, Kosrae, FSM: Kosrae Conservation and Safety Organization (KCSO):

The KCSO and its partners undertook a six-month process of community outreach and consultations to share and gather information for the Project and determine the priority adaptation actions that would be implemented by the community. A core planning team was developed to help support the outreach and planning process. Core planning team members were made up of landowners in the Malem watershed, as well as representatives of key government agencies who support watershed management. The chairman of the core team arranged community meetings for the project with support from the Mayor of Malem. All community members (male, female, elderly and youth) were encouraged to participate in meetings.

The following results were achieved:

MPA Endorsement — During the Project, KCSO and the community held five management planning sessions: the 30<sup>a</sup> of October 2017, a 3-day session between the 17<sup>a</sup> and 19<sup>a</sup> of January 2018 and a final meeting on the 5<sup>a</sup> of February 2018. All meetings were attended by approximately 32 people each time to review drafts and update the objectives and actions where required. The plan was finalized in a core team meeting, attended by 23 people, and officially endorsed by the Mayor during a project completion ceremony. The plan is being finalized and will then be submitted to the KIRMA who will review it for any environmental impact and if approved, send it to legislature for legal declaration. All community endorsed MPA plans provided to KIRMA prior to the Malem plan have been approved. While the process

can be lengthy, once submitted, it is expected that the plan will be approved. Once there is final endorsement by the Kosrae State Governor's office and legislature, the site will be included in the Kosrae PAN. There is a strong project team supporting the plan from the community to move this process along more quickly. Protected areas that are part of the PAN are eligible for funding to support management of the site. Establishment and endorsement of this plan will lead to sustainable funding opportunities to manage it into the future.

• *Waste Management* — Three clean ups were held during the life of the Project (one per hamlet or community). Approximately 20 people participated in each clean up and each hamlet removed at least five truckloads of waste. Waste was collected and removed from illegal dump sites and the former dump areas were filled in with soil to help reestablish them. There was very strong project support across the island and various contributions were made from different agencies. 33 bin platforms were built by the Department of Public Works (DPW) who contributed labor for the construction at no cost. Unfortunately, as DPW was extremely busy at that time, the construction took a considerable amount of time so another 42 were contracted by a private contractor and built. The Kosrae Department of Health supported the project and donated the oxygen needed to weld the rebar platforms together. The Department of Education also donated rebar, allowing for an additional six platforms to be built for the Malem Elementary School. By the end of the project, each of the three hamlets received 25 platforms and the school received six platforms. Each platform holds two trash bins leading to a total of 162 trash bins distributed by this project. All of the platforms were painted by community members in each of the three hamlet colors to help protect them from rust.

#### Pakin Atoll, Pohnpei, FSM: Conservation Society of Pohnpei (CSP):

The residents of Pakin rely mainly on subsistence crops (breadfruit, coconut, banana, some taro) and reef fishing (traditionally with fish traps, but now by spear fishing). They also raise pigs that roam freely on all islets, partially fed with copra, and partially foraging food on their own. In Pohnpei, pigs play an important cultural role for traditional ceremonies and offerings as well as a source of food (e.g. if fish catch is poor or fuel cost for fishing is high, pigs will be consumed) or for income. An initial vulnerability assessment was completed for Pakin in 2014 through the European Union Global Climate Change Adaptation Project (EU-GCCA). A fisheries management plan was also developed for Pakin in March 2009. One of the priority actions identified by the community included conducting awareness on issues related to climate change including the identification of actions to reduce impacts. The BMUB project expanded on the understanding of socio-ecological linkages and vulnerabilities and identified key ecosystem-based adaptation projects to be funded. Information from the EU-GCCA vulnerability assessment and Fisheries Management Plan were used as a foundation during the 6 months of community consultations and discussions to develop an adaptation plan for this project through BMUB funds.

During the adaptation planning process, the community focused on developing actions for agriculture and food security including ways to improve the resilience of crops to droughts, extreme rains, and sea level rise. They also focused on actions for coral reef ecosystems and fisheries livelihoods including ways to improve the resilience of marine resources in the face of sea surface temperature increases, sea level rise, and increasing runoff from extreme rain events.

The following actions were carried out by the BMUB project:

- <u>Improved Piggery Management:</u> A total of 17 pig pens were built by the community with approximately 24 community members contributing to the construction. All 200 of the pigs on the island are now fenced in. While the action was completed, there were some unexpected challenges that will require ongoing attention and support after the end of the BMUB project. Specifically, community members lacked the knowledge necessary for managing fenced in pigs (feeding/water/spacing requirements) and the pigs were not used to being fenced in. For this reason, some pigs began to lose weight and stopped breeding and some community members wanted to release their pigs.
- <u>Sustainability Plan for Pakin</u>: with the assistance of the US Natural Resource Conservation Service (NRCS) and The Nature Conservancy, technical support was provided to improve the understanding and skills of community members on piggery management. This included specific instructions on the design of the pens and methods for composting dry materials to minimize the likelihood of the pig waste contaminating water sources including increasing the quantity of litter and ensuring that there is limited muddy soil. As well, NRCS provided a series of key recommendations for managing the pigs including information on the appropriate methods for maintaining pig health and production including formulas for feed, water, and gender ratios. After meetings with the College of Micronesia Land Grant Program and the USDA Natural Resource Conservation Services, the college advised the project team to build compost pins so that the waste collected could be used for fertilizer. A sustainability and monitoring plan is now in place for

post-BMUB implementation. NRCS plans to visit the atoll quarterly and will be taking soil and water samples as well as continuing to provide ongoing training when necessary and monitoring the health of the pigs.

#### Oneisomw Watershed, Chuuk, FSM: Conservation Society of Chuuk (CCS):

Climate change awareness and planning consultations began in 2012 through support from the CCS and TNC. As such, the information from these consultations was used as a foundation for the BMUB project. Between January and April 2016, CCS, in collaboration with TNC and MCT, compiled available information, including the initial draft the Oneisomw Management Plan to identify the remaining gaps to meet all BMUB project requirements. The BMUB project supported the following activities:

- Well Restoration and Re-vegetation In 2016, TNC in collaboration with technical support provided by NRCS-USDA conducted an assessment of the water resources in Oneisomw. This included a baseline assessment on the location and conditions of springs and wells in Oneisomw. The NRCS-USDA team conducted a thorough survey of each of the water resources identified by the community during previous consultations (2015 and 2016). Wells and springs were assessed together with the surrounding areas and related water problems were discussed with the community (e.g., sediment in the water and algae). Findings of the assessment were presented to the Natural Resource Committee, a group made up of local leaders and community representatives to guide the BMUB project and other resource management efforts. Based on recommendations by NRCS, the community restored eight wells critical for water security and re-vegetated nearby areas with lemongrass to prevent sediment and pollutants from running off into the wells.
- Learning Exchange From Jan 15<sup>a</sup> to 19<sup>a</sup> 2018, five Oneisomw community members and the Executive Director of CCS journeyed to Yap for a learning exchange. Community members included; the Paramount Chief, a representative of the women and youth groups; a Chief/ municipal judge/ reef owner; and a reef owner and church minister. In Yap, the group visited two active community groups. The first was the community that manages the Nimpal Channel Marine Conservation Area, a very successful community based locally marine managed area. The second was the Tamil community, another BMUB site that developed a terrestrial protected area and community nursery. The Oneisomw participants took away several important lessons from this trip including:
  - A better understanding about the effective of no-take zones for improving bio-mass and species variety and restoring of coral reef ecosystems
  - An improved understanding of the link between land activities and near shore marine health; including management for the reduction of chemical use like detergents
  - The possibilities for communities to take ownership of natural resource management and be successful. The group was particularly inspired in Yap because they have similar cultural and constitutional rights and returned home feeling that they could do much more to manage their own resources based on their cultural framework

#### Tamil Watershed, Yap, FSM: Yap Community Action Program (YapCAP):

YapCAP and the local coordinator for the project under TRCT undertook a six-month process of community outreach and consultations to share and gather information for the BMUB project and determine the priority adaptation actions that would be implemented under this funding. Based on the 117-year historical timeline gathered by the community, the most frequently occurring climatic events are typhoons and drought. Typhoons damaged homes, public facilities, infrastructures and livelihoods and recovery is burdensome. Drought was identified as a main concern because (i) extreme heat exposure hinders farming/gardening, (ii) lack of fresh water dries up taro patches, the main staple food of the community and (iii) there is limited potable water for families. Also, water is managed on a scheduled basis; running water is available at certain hours in the morning and in the evening. Based on these discussions, the community focused vulnerability assessments and local action plan development for; 1) Fresh Water Resources, and 2) Land based Food Crops/ Agriculture. The third priority of the community is their fisheries, however, as they already have a Marine Management Plan, it was agreed that information on their fisheries section of the LEAP would come from and feed into existing documents. Vulnerability assessments were completed for each of the two priority targets and an adaptation plan was developed including the following goal, objectives and actions to complete through BMUB funds:

While the community prioritized three objectives actions, Objective 3 was not completed through the BMUB project. All other actions were completed under the BMUB project including the following results and on-going activities.

- *Water Conservation Area* The purpose of the water conservation area is to protect the underground aquifer, the main water source for Tamil and other municipalities. Technical assistance was not available to determine the exact location of the aquifer so the group decided to develop zoning and rules to prevent further contamination from land-based pollutants and loss of water from wildfires and drought. To develop the conservation area, a group of stakeholders including the Tamil Council, TRCT, Gagil-Tamil Water Authority (GTWA), the Tamil Women's Organization initiated consultations with the community to identify the most important areas of the watershed. Developed areas and private lands were also considered to minimize conflict. Based on these consultations that included over 10 villages, the Tamil Elementary School, and 150 people, the boundaries and guidelines for a large watershed conservation area were officially proposed by the Council. The area contains the pumping station and surrounding land areas, ponds, a dried-up stream and taro patches. The western boundary was based on an existing fire breaker so as to prevent future wildfires from entering the area. The established rules for the area include: no fire, no mass development, no earth moving, no dumping, no loitering, and no hunting. The declaration of the protected area was also signed by The Municipal Chief, Chairman of the Tamil Council and the Council members, the TRCT Chair, and the YapCAP Director. Protected areas that are designated by traditional leaders in communities are legally declared under the Yap Constitution.
- Community Nursery The community nursery was completed in August 2017. Sixteen community members helped to build the nursery. The location of the nursery is in an area regularly used or community gatherings making it highly visible. A nursery Coordinator was hired to propagate seedlings and water the plants daily. The choice of plants in the nursery was selected based on a community survey conducted during outreach and planning to identify which plants were most desired by community members. Plants include mahogany trees, medicinal plants, some fruit crops, cabbage, tomato, and pepper. After the first BMUB gender workshop hosted in Palau in 2017, the women who attended from Tamil began the Tamil Women's Association (TWA). They have become collaborators with TRCT on the nursery and help to care for the plants and sell them. The College of Micronesia (COM) Land Grant provided technical support to the community for composting and making organic fertilizer from local materials like coconut husks. Finally, the State Division of Agriculture donated tree plants to the nursery to help support the existing fire breaker program in the community. Community members have already begun to purchase plants from the nursery, and a portion of the profits go to the TWA and a portion to TRCT. The nursery provides a convenient place to purchase plants for local residents, many of whom do not have transportation to town to visit other markets. The nursery increased the strong sense of community pride and caught the attention of other communities who are looking to replicate the process. Finally, as the nursery is located near the Tamil kindergarten building they contribute to the meal plan of the school Recently a new cafeteria was built and there are now plans for the nursery to supply local food to be used for student lunches.

#### Melekeok, Republic of Palau (ROP): Melekeok Local Government (MSG):

The core planning team for the project prioritized actions for the coastal area and water resources only for the BMUB project. It was decided that focusing on protecting the upland area from erosion and sedimentation would also help improve reef health. The Governor and the State Legislature further approved these two objectives and actions. The objectives and actions were completed under the BMUB project including the following results and on-going activities.

- Water Resources To date, a total of 1,500 lemongrass plants were planted to prevent erosion of barren lands and nearly 300 various native trees have been planted to encourage reforestation over time in the watershed. Approximately 62 community members (including members from other states) and 84 students helped with the planting. The lemongrass was planted close to a stream and dam near Ngardok Lake to help prevent sediment from erosion from entering the water source. The re-vegetated area covers about 70% of the barren land in that area. It was also mulched and organic fertilizer that is used every few months to encourage growth. Monitoring shows that all the lemongrass has survived while 20% of the trees have survived and the growth rate is very slow. The MSG is now trying another method to improve survivorship of trees in a demonstration site. Seedlings are grown in the Ngardok Nature Reserve nursery until they are mature and then planted at the site.
- Coastal Area Guidance MSG is working on a residential lease/housing program in an upland area to provide a safe
  place for people to relocate away from the coastline. The State leadership identified a location for the planned
  subdivision in the upland areas. As proper subdivision planning in Palau is a new endeavor, this project aimed to
  developing a sub-division plan and guidance for climate smart building in the lease land. A final draft of the guidance

document called "Climate Smart Resilient Development in Melekeok State" was developed through this project (see Appendix 15). The document was developed to provide resilience guidelines and proposed policies for both present and future development in the state that will help the Melekok community reach the following objectives:

- 1. Become more resilient to existing and future climate conditions; and
- 2. To maintain and enhance ecosystem services.

In order to meet these broad primary objectives, the document includes:

- A Draft Sub-Division Plan for roughly 108 10000sq ft lots and a set of recommended policies to help development meet the following secondary objectives:
- Ensure sustainable and resilient relocation and development;
- Conserve water resources;
- Reduce energy consumption and greenhouse gas emissions;
- Promote food security;
- Design simple and innovative utilities to avoid high maintenance costs; and
- Reduce solid waste.

#### Kayangel Atoll, ROP Palau International Coral Reef Center (PICRC) and Palau Conservation Society (PCS):

This project utilized and built from a prior vulnerability assessment and actions completed through the EUGCCA project. Key targets for adaptation were identified as water security (freshwater resources) and food security (both fisheries and agriculture). The Palau International Coral Reef Center (PICRC) completed a six-month outreach and planning phase of the BMUB project focusing on these two targets. The following strategies and actions were completed by Palau Conservation Society during the implementation phase:

- *Fisheries Communications*: a poster and stickers were developed to support the northern reef fisheries project including a broad new set of fisheries management rules. These products were printed for a training of 30 community rangers and used during a presentation by PCS. PCS also participated in an Earth Day Conference attended by 150 community members. PCS conducted a fish game to encourage an understanding of the importance of fisheries management to prevent over-fishing. After the game, PCS asked questions to test knowledge and comprehension and gave away posters and stickers for successful responses to the questions.
- *Alternative Livelihood:* A set of 5 electric reels were provided to the community for fishers to share. Electric reels allow fishers to catch deep water bottom fish and reduce pressure on the reef (and comply with new fisheries regulations for the Northern Reefs). The reels are housed at the ranger station on Kayangel and maintained by the rangers. They need to be signed out for use and are open to all community members. Fishers have been trained on the use of the reels through another project for the northern reefs.
- *Household Gardens:* PCS provided each household on Kayangel with a composter and carried out outreach on how to use it and the importance of composting. A pilot raised bed garden was completed at the school as a model for the community household gardens. A member of the community with land adjacent to the elementary school agreed to donate land for the school garden. The school Principal, the science teacher, and the school cook also participated and supported the development of the school garden by ensuring successful implementation and contributing their professional expertise.
- *Water Conservation Communications* PCS conducted outreach at the school on water conservation where all students, teachers and the Principal, were exposed to information on water conservation practices. Moreover, PCS conducted house to house meetings to further share the information and reached 23 households (nearly all of the 27-active household). They reviewed outreach materials on water conservation practices and provided water bottles, stickers, and a brochure with water conserving tips in these meetings.

### **Objective 5. Through at least fifteen locally-based projects, strengthen the management and effectiveness of protected areas and Micronesia Challenge PANs across the region:**

The project *Supporting more effective natural resource management in Micronesia*, is directly complimentary to the goals of the NOAA coral reef monitoring project and represents a portion of MCT's matching requirements for this grant. Under this project, MCT solicited applications for projects that would result in more effective management of natural resources, strengthen jurisdiction protected areas networks, and address major threats facing protected areas including: loss of traditional conservation practices and institutions, invasive organisms and pest species, conversion and degradation of habitats and ecosystems, over-exploitation and unsustainable harvesting methods and practices, pollution and lack of waste management, low levels of management capacity, and climate change impacts including sea-level rise and extreme weather events. During this request for proposals, MCT sought projects to be implemented in the Federated States of Micronesia, the Republic of Palau, the Republic of the Marshall Islands, and that would support the framework of the regional Micronesia Challenge. Legally recognized non-profit organizations including: non-governmental conservation and resource management organizations; associations; schools, colleges and universities; religious organizations; research organizations, community-based organizations and State and Municipal government agencies were eligible to apply. There were fourteen applications submitted and eleven made the short list. After the MCT Technical Committee completed its review process for the eleven short-listed applications, the MCT Board approved the following projects. A summary of the projects and their progress for this over the life of this project follows below:

### 1. Palau Conservation Society (PCS): Cultivating the Course for Effective Management of Protected Areas and Inform Culture of a Pristine Paradise Palau (\$38,657.74)

*Summary:* This project aimed to revise, and update protected areas management plans for the Kerradel Conservation Network of Ngaraard and the Ongedechuul System of Conservation Areas of Ngardmau. Both sites have five-year management plans that had lapsed or were going to lapse in the near future. In addition to updating the two management plans, PCS was putting together a public information educational pamphlet describing all of Kerradel and Ngardmau's protected areas. PCS anticipated that the Protected Area pamphlet would allow students, the local public, visitors, and researchers to learn important conservation information of Palau's protected areas from a single pamphlet/handbook.

*Progress:* Project implementation took place beginning on August 15th, 2016 and ended on September 30th, 2017. The project proponents accomplished the objectives of this sub-grant and completed the initial contract. Objective 1 of the project was to update two community-based five-year management plans for the communities of Ngardmau and Ngaraard. The management plans were successfully completed and accepted by the communities. Hard copies of the management plans were produced for the state offices including soft copies and uploaded onto the PCS website. Objective 2 of the project was to develop a protected areas informational pamphlet. The project team worked successfully with protected areas coordinators to develop contents, agree on a layout and design format, and produce the pamphlet. Hard copies of the pamphlet are now available at PCS for distribution to the public, state offices, and a soft copy can be obtained on the PCS website.

### 2. Conservation Society of Pohnpei: Enhancing Monitoring Surveillance and Control on Ant Biosphere Reserve in Pohnpei, FSM (\$32,400.00)

*Summary:* Ant Atoll is located just 7 miles south of the main island of Pohnpei in the FSM and consists of a chain of islands that serve as nesting sites for green hawksbill turtles with a massive coral reef complex that serves as an important habitat for a diversity of nearshore and pelagic species. The islands are home to a huge population of fruit bats, Micronesian pigeon, seabirds and coconut crabs. Ant Atoll has been identified in the FSM National Biodiversity Blueprint for Biodiversity Conservation as a high priority area for protection and management. It is also an important coral larvae source for the reefs of the main island Pohnpei. Ant is unique in all the islands of Pohnpei because its managed by the Nanpei Family and Rohsa. This project supported the enhancement of enforcement and long-term management of Ant Atoll with team capacity building including coordinated outreach programs and an income generation plan. The team also developed a five-year management plan for Ant, secure urgently needed ranger's equipment, and trainings and conducted outreach and awareness activities in targeted communities around Pohnpei.

*Progress:* Project implementation took place beginning on August 15th, 2016 to March 31<sup>st</sup>, 2018. Through a partnership with OneReef Micronesia, the management of Ant Biosphere was able to secure and install a radar system to pilot remote surveillance and monitoring in Pohnpei. In addition, CSP worked with Ant management to secure a solar panel system through another grant from Seacology to support the radar system. The Ant Rangers continued their monitoring and enforcement activities around the Ant Lagoon. During this project, the Ant rangers worked with Pohnpei State Fish and Wildlife to investigate an illegal pigeon hunting event that occurred on the island of Pahnmwok. Four officers visited Ant and conducted the investigation. Rangers also caught a boat with a turtle inside and a second turtle in the process of being lifted into the boat. The Rangers immediately reported

the incident to Pohnpei Fish and Wildlife. Visitors continued to visit Ant for recreational activities. Traditional leader Rohsa and Rangers in partnership with the College of Micronesia Land Grant launched its first Giant Clam (Hipopos hipopos) farming project where 500 juvenile clams were distributed in its designated aquaculture grounds. The clams were monitored by Rangers and Rohsa worked Aquaculture professionals to seek further recommendations towards the continuation and expansion of their Clam project. In 2017, Ant hosted the 13th Annual cross site visit where Community Conservation Officers (CCO) from all Pohnpei community MPA's gathered and shared lessons learned from their annual work conducted within each respective site.

#### 3. Conservation Society of Pohnpei: Mobilizing MPA Communities to Increase Adaptive Fisheries Management Capacity in Pohnpei, FSM (\$43,987.90)

Summary: Fishery managers often must make decisions regardless of data availability or completeness of scientific understanding. Existing and new legal mandates, such as requirements to establish seasonal bans and size limits to each fishery, as well as the ongoing need to improve understanding of fish stock dynamics, are driving efforts to develop more efficient ways to assess fish stocks when resources are insufficient based on a full stock assessment. In Pohnpei, there is an increasing recognition of the need to assess stocks at smaller spatial scales as too often, lack of data and/or proper data analysis results in lack of management. This poses risks to the economic and biological sustainability of fisheries. With this project, the application of poor data stock assessments, while subject to many limitations, can reduce the risks by providing guidance for management and increase awareness within fishing communities in Pohnpei. This project supported consultation meetings with government and traditional leaders, fishermen and social groups of three municipalities. Through guided workshops, management priorities were identified for each municipality to define roles, responsibilities for monitoring and identify key threats and targets affecting the MPAs. CSP conducted various workshops and trainings where communities were equipped with appropriate tools to take part in the management of their fisheries. Fisheries management tools such as size limits and gear types are exercised at sitebased level to provide pilot evaluations from community to community. Temporal management targeting known spawning species at targeted municipalities will be developed and exercised. At least 2 municipal ordinances were developed and spearheaded by MPA communities at the targeted municipalities to support fisheries management. CSP also conducted an analysis and assessment of management practices amongst the communities that have stewardship to MPAs. Management recommendations will be presented to Pohnpei State officials and to existing Municipal ordinances and Conservation Action Plans (CAP).

*Progress:* Project implementation took place beginning on August 15th, 2016 to March 31<sup>st</sup>, 2018. In April 2017 CSP, with support from Rare Micronesia, MCT, TNC and other partners worked with the Kitti Municipal Government to finalize the development of the Kitti Municipal Government's Fisheries Management Plan. During the same month, the Paramount Chiefs of Kitti, and the municipal government representatives Mayor (Luhkenmoanlap) and the Speaker of the Kitti municipal council officially endorsed the plan. The Kitti fisheries management plan is now in place and ready for implementation. During this reporting period, the U Municipal government, in partnership with CSP and MCT, hired a new Natural Resource Coordinator as outlined by mandate of their fisheries management plan to fully implement plan activities. Moreover, the MPA Network Executive Committee continued to meet monthly to plan for the annual cross site visit that occurred on August 5th and 6th, 2017. A total of eighty participants attended the exchange representing community MPAs from the following Pohnpei communities: Pakin, Ant, Palikir, Sapwitik, Dehpehk/Takaiou, Nan Wap, and Peniou community protected areas. Partners from local, state, and national government also participated and provided key areas of support. Each member of the community MPAs presented challenges and accomplishments, followed by open discussion to allow members from individual sites to learn from one another.

### 4. Conservation Society of Pohnpei: Supporting Depehk Takaiou and Lenger MPAs as Model Sites in Pohnpei, FSM (\$38,400.00)

*Summary:* CSP ans the Village Chiefs of Lenger and Dehpehk/Takaiou requested a grant to support the monitoring and surveillance and enforcement efforts for these two MPA's. Since enactment of the legislation creating the Dehpehk/Takaiou and Lenger (Sapwtik) MPA's, these communities had tried to implement a community-based resource management program. Over the years they had organized themselves and worked with partners to support the long-term management of these sites. These efforts although genuine, were inconsistent and ineffective due to the lack of funding support and planning. In 2015, these communities took a bold step and developed a five-year management plan and gathered all their traditional leaders and state and municipal partners to endorse this plan that outline their vision, mission, goals and objectives. This grant funded some of their goals and objective to further enhance their sites by purchasing needed surveillance equipment, conducting targeted outreach and awareness, complete a follow up biological monitoring survey and train community members to be effective in their role as stewards of these important MPA's.

*Progress:* Project implementation took place beginning on August 15th, 2016 to March 31st, 2018. Site Coordinators conducted their general community outreach for both Dehpehk/Takaieu and Lenger communities. On May 19, 2017 project coordinators

along with 3 other members from the Dehpehk and Takaiou community and Lenger attended a one-day biological monitoring training course at the CSP office conducted by CSP's marine program. Through this project, the community acquired 2 used boats to be used for monitoring and enforcement activities in the newly established MPA's. CSP and its partners drafted and finalized Standard Operations Procedures (SOP) and a draft Joint Enforcement Agreements (JEA) for the two MPA Communities. A meeting was held at the U Municipal Government to finalize the Dehpehk/Takaiou draft documents. Community Conservation Officers (CCOs) from both Dehpehk/Takaiou Community and Lenger/Sapwitik community participated in training on surveillance and enforcement with the Division of Fish and Wildlife, U municipal Police and Nett District Public Safety. This Training course was facilitated by PIMPAC to orient the CCOs and the local enforcement units of the two MPA communities on the local government MPA laws and sea cucumber laws.

### 5. Palau International Coral Reef Center: Monitoring and Assessing the Impact of Growing Tourism on Coral Reefs in Palau, Micronesia (\$32,600.00)

*Summary:* Since 2010, the Republic of Palau has experienced a rapid growth of the tourism sector, especially to the Rock Islands Southern Lagoon (RISL), a World Heritage site. The area features high biological diversity and is a managed area for recreational activities, subsistence fishing and restricted commercial use. Although this tourism growth is benefiting the economy of Palau, the impact of increasing numbers of visitors is unknown. Several new hotels and restaurants have been built in the past five years and an increasing amount of local seafood is served on a daily basis. The two main objectives of the study were to (1) assess the impacts of snorkelers' behaviors on coral reef communities in the Koror State RISL World Heritage Site (UNESCO), and (2) investigate the impacts of tourism growth on coral reef fish communities as a result of the increased demand for local seafood. PICRC is a semi-governmental organization that has the main mission to guide efforts supporting coral reef stewardship through research and its applications for the people of Palau. This project seeks to documented.

Progress: Beginning in October 2016 and ending in October 2017, the objectives of this sub-grant have been accomplished and this contract has been completed. Under the 1st objective "impacts of snorkelers' behavior", a total of 10 ecological surveys and observation of snorkeler activities were conducted at 5 selected popular snorkeling sites (visited) and 5 reference sites (nonvisited sites) during both low and high tourist seasons. Ecological survey indicators were benthic coverage, coral fragment density and fish abundance and biomass. Data collected have been analyzed and full results are provided in a technical report that has been drafted and is pending approval. A basic summary of the results found that snorkelers significantly increased the number of coral fragments in shallow coral reefs. Half of the time, snorkelers were found to make contact with the reef mostly by kicking with fins that break the coral. The most vulnerable corals were found to be the branching corals. Results of the pilot study were presented in a Responsible Tourism campaign for tourism companies/agencies. Under the 2nd objective "investigate impacts of tourism growth on coral reef fish communities", underwater baseline surveys of commercially important fish species were conducted in 61 sites all around Palau reefs excluding the northern reefs of Ngarchelong and Kayangel States and southwestern States of Hatohobei and Sonsorol. The underwater fish survey indicators included trends in fish biomass and abundance of different commercially-important species and fish families over time. Videos from all 61 sites surveyed have been processed and a technical report is currently being drafted. As the information collected is baseline data, it will be important to continue to survey reef fish stocks to gain an understanding of how or whether the increased demand for local seafood for the growing numbers of tourists is impacting reef fish stocks in Palau. It will also be useful to combine this data with the Northern Reef surveys to understand how fisheries are being impacted throughout Palau. Preliminary results show very few hotspots of high reef fish biomass surrounded by very large areas of low biomass. Further studies should be completed to gain an understanding of why some areas are hotspots. Once there have been subsequent studies to compare with the baseline data, the results of the surveys will be shared with communities, government and other partners to inform fisheries management practices. Both technical reports will be made available to National and State Governments, communities and partner agencies and presented upon request. Electronic copies of the report will be posted on PICRC's website (www.picrc.org) and provided to MCT.

### 6. Hatohobei Organization for People and the Environment (HOPE): Strengthening the Compliance and Enforcement through Effective Coordination and Networking (\$33,000.00)

*Summary:* This project was designed to serve all the protected area sites in Palau through capacity building for the field staff, conservation officers, or others that responsible for the effective management of the sites. All States in Palau presently have conservation areas, some of which are either current members of the Palau PAN or expectant members. The goal of this project was to 1) To conduct an assessment of all the member states to analyze gaps where within their programs and policies using the purposed toolkit, 2) Conduct at least four (4) sites visits exchange to help other state gain knowledge and improve their sites. 3) helping to develop a legal document such as a memorandum of understanding between the state members to be use as their base to work hand in hand in enforcing their laws effectively.

*Progress:* Project implementation took place beginning on August 15th, 2016 to May 30th, 2018. HOPE began project implementation by meeting with the coordinators of the following community sites to discuss the project and complete

assessments of their sites-based monitoring and enforcement plans to identify gaps: Aimeliik, Airai, Ngaraard, Hatohobei, Angaur and Ngerechelong. Gaps included lack of templates for investigative forms that are used in routine patrol to easily report activities and incidents as well as for proper record keeping. Throughout the project, the APCO team worked closely with these six state members using an enforcement toolkit to improve their reporting mechanisms. They also conducted in house trainings to build site-based capacity to perform duties more effectively. They also assisted in the development and updates of site enforcement plans and other policies that will help them in their daily work as enforcement officers. In 2018, HOPE conducted a refresher course for enforcement officers including topics such as Officers Survival, Report Writing, and Vessel boarding. Other activities including completion of assessment for at least two more sites, completion reports on at least 8 sites assessments total, conducting site exchange visits, conducting at least 2 trainings for state on priority areas, and reporting on the progress.

### 7. Ebiil Society, Inc.: A Fisheries Improvement Campaign to Increase Observation and Practices of "Sustainably Caught Fish" as a Marketing Concept (\$45,000.00)

*Summary:* This project funded a campaign intended to raise awareness and promote fishery practices and consumption that supports a sustainable fishery for Palau. It was the continuance of the Ebiil Society's long-term fisheries management project that began in 2011. From the data collected during the first project, they have developed a campaign focused on influencing improved policies and practices for a resilient fishery in Palau. The project targeted the main fishing communities of Koror and Ngarchelong in order to influence the whole of Palau. The Ngarchelong fishery represents a more traditional, subsistence-based setting whereas in Koror, the fishing community has evolved and become more diverse with more recreational fishermen and small entrepreneurs. The main objective of this project was to improve monitoring in order to improve product traceability, reduce illegal fishing and unsustainable practices.

Progress: This project successfully completed in August of 2017. A network referred to as "Sustainable Seafood - Palau" was initiated and organized as part of this campaign to sustain Palau's fishery. Ebiil's work towards a sustainable fishery for Palau began over 6 years ago with a fishery monitoring project that lasted 3 years, followed by a campaign to improve fishery regulations and practices and the current goal to increase understanding of market dynamics to improve transparency and consumer choices to support sustainable seafood. There is currently a network of 33 fishers, 8 restaurants, and 1 fishing cooperative involved in this project. The network is connected by an application called OurFish, a cloud data bank that allows restaurants and fish buyers to track their purchases from member fishers. The system is managed by the program designer in California through Rare and monitored by Ebiil as an administrator on a regular basis. The main objective of the campaign is to improve market transparency giving consumers the power to choose sustainably caught seafood that promotes the sustainability of Palau's fishery. The objectives of the campaign were designed based on a theory of change with results based on a pre/post Knowledge, Attitude, and Practices survey. The theory of change says that in order for a person to adopt a new behavior they must have the knowledge needed to make the change, understand the impact on his livelihood, have the opportunity to validate his decision with influential people in their life, receive direct benefit/reward or skills required to practice new behavior and then adapt the new behavior. At the end when people adapt the new behavior that promotes sustainability and protection of the environment plus reinforcement in form of policy or restoration shall we see conservation results. Future efforts will target increased participation in the sustainable seafood trade network by fishers and seafood buyers, restaurants, and other outlets that participating in the trade of seafood. The long- term objective is to have this approach be adapted as a national system that is either expanded or replicated as a market-licensing requirement. This makes it so that all seafood market or outlet will be required to keep track of all their suppliers through similar tracking system and have developed certification process. Increasing use of such a strategy will increase market transparency and consumer choices promoting sustainable seafood for Palau.

#### 8. Coral Consulting: Expansion, Maintenance, Visualization of the Micronesia Challenge Coral Reef Monitoring Database (\$50, 438.56)

*Summary:* The Micronesia Challenge online database (www.micronesiareefmonitoring.com) was established in 2015 with a previous sub-award from the Margaret A. Cargill Foundation. This platform was set up to provide data storage security, easy and standardized access, and a simple means for local monitoring programs to enter new data. This progress has all been timely and immediately useful. The current project is improving the security, efficiency, and transferability of this online platform, and will also bring custom-defined data visualization tools to the online site. UOG aimed to have all database improvements addressed first to maximize a beta-testing period with the improved platform to enter and store data in a user-friendly manner. The main goal was to improve the efficiency for users so that they can enter new data with high accuracy, and limited errors. Next, UOG planned to build graphics into the database as a second priority objective. Graphics were to be developed in a spatial context, allowing the user to focus on the data of interest, and make plots depicting the set of data with Google-based maps. Last, they planned batch loading all the new fisheries-dependent datasets. During this project, the fisheries dependent data (i.e., market-based data) would not be further manipulated. The database administrators aimed to store the existing data with secure back-ups so that all of the past and present market-based data collected will be loaded. The project aims to build an excellent, open-source

online data warehouse that will facilitate science-based management decisions. In sum, easy access to science for all needs, with a framework for long-term sustainability.

Progress: This project began on August 15<sup>th</sup>, 2016 and ended on January 31<sup>st</sup>, 2019. The project has successfully built a centralized, online database to hold the coral and fisheries information being collected by the Micronesia Challenge jurisdictions, and to produce summaries of the data for immediate use in conservation work. The database is now being released to partners and UOG continues to train local partners om its use. Major enhancements include automated backups of all data three times weekly, access to automated graphics describing datasets, user-based access to data, and easy data entry protocols (*Figures 1-3*). UOG can now serve data within weeks following data collection to assist pressing management needs. For example, just weeks after data collection in Pohnpei in 2017, UOG were able to produce automated graphs showing the decline in sea cucumber abundances to help guide harvesting decision policies that are still ongoing (*Figure 4*). UOG's goal into the future is to try and combine funds to expand the database to include fish catch composition data as well.



Above: Front page of UOG new regional monitoring database showing the need for credentials to login and use the system. This can be seen from any browser, but to login one needs a username and password. (https://dev.micronesiareefmonitoring.com/login)



Above: Automated views of the data can now be produced to help resource managers in discussing trends efficiently with stakeholders. This screenshot shows trends in fish biomass around Pohnpei Island. By clicking buttons one can change data sources, islands, and years.

Challenge						
Survey Event						
Site	Select an Item PNI-1					
Event Date	3/3/2019					
Observer	Text, max length 10 PH					
	Text, max length 20					
Transect Depth	8m					
Transect Depth Survey Event Data	8m					
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Above: Data entry screenshot showing the simplified process for entering new data once fieldwork is completed. Scientific fish names are automatically spell checked so no errors exist in the uploaded data.

# 9. University of Guam Research Corp: Improving Marine Resources Management for the Micronesia Challenge in Palau through ecosystem-based fisheries management: fisheries-dependent monitoring of commercial reef fisheries (\$40,920.00)

Summary: Micronesian coral-reef ecosystems host a wealth of biological biodiversity, ecological complexity, and fisheries potential. These have all played a central role in Micronesian societies for generations, while being sustainably exploited for subsistence purposes through customary practice. Over the past decades, however, increasing and unregulated fishing pressure has led to decreases over time in both fishing success and ecosystem condition. Palau's well-developed nearshore fishery is estimated to be one of the largest coral-reef fisheries in Micronesia, yet, available evidence indicates a general decline in fishing success for the most popular species. Regardless, limited fisheries baseline availability has hampered the development of tailored, data-driven, ecosystem-based fisheries management (EBFM) aiming to maximize findings along ecosystem functionality, biodiversity, and other non-extractive values (i.e. tourism). Aiming to address this gap, this project supports the amelioration of pressing fisheries management needs in Palau (and in wider Micronesia) by providing quantitative fisheries-dependent baselines to assess the status of targeted reef-fish populations. Previous fisheries-focused studies in the main commercial markets of Palau have been intermittent, surveying either a few months within a year, one day within each week across the year, or a subset of species in the Ngarchelong State fishery in Northern Babeldaob. While clearly useful for generalizing fisheries and providing site-specific insight for northern Palau, a robust understanding of Palau's overall coral reef fishery remained lacking. Questions requiring further exploration included: (i) the dependence of catch success upon seasonal and lunar cycles, (ii) the distribution of fishing pressure across Palau, (iii) species-based responses to fishing pressure, and (iv) links between fishing pressure and the ecological condition of reefs. UOG is collecting comprehensive information regarding commercial reef-fish landings through a combination of fisher interviews and daily species-based landings at the main fish markets of Koror, following methodologies developed by the principal investigators and recently put into practice during fisheries-dependent assessments across several Micronesian jurisdictions. Expected fisheries-dependent databases, together with available fisheries-independent databases, will be critical for balancing Palau's reef fish landings with desirable ecological states. UOG conducted the data collection component of this process and provide an initial assessment of Palau's fishery through scientific publications and interpretation to stakeholders. Initial monitoring training was conducted in November and December. Members of PICRC and Koror State rangers were trained in standard fisheries monitoring and SEM-Pasifika socioeconomic monitoring methods.

Progress: Project implementation took place beginning on August 15th, 2016 to September 30<sup>th</sup>, 2018. In 2017, 52 fishers' interviews were conducted. Coupling these interviews, over 6,000 fish have been measured and identified to species level (adding to over 20,000 for the whole project). In addition, records of daily landings from individual fishers have been recorded during

the same period, totaling over 329 individual landings records and over 50,000 pounds of fish. Following the data analysis conducted in June 2017, and adaptation of monitoring protocols to compensate for shortcoming detected (i.e. increasing monitoring effort in the mornings to capture spearfishing landings), positive results from new monitoring protocols were found when exploring datasets for the reported period.

### 10. Kosrae Conservation and Safety Organization (KCSO): Ensuring Effective Biodiversity and Ecosystem Management in Kosrae (\$49,596.00)

Summary: The project focused on increasing the awareness and understanding of Kosrae's communities regarding the importance of biodiversity, ecosystem health, and resource management. This project was to result in the Lelu community, which is one of the 5 communities in Kosrae, having a management plan to assist them in managing their MPA. In the long run, KCSO believes that this project will also result in more support for conservation in Kosrae as a whole. The project will also allow for the more effective management of marine areas and biodiversity, thus improving the overall health and conditions of both biodiversity and ecosystems in Kosrae. The two main project objectives were: to have a management plan for the Awane Marine Park that is developed through the conservation action planning process and submitted for approval to the Kosrae State government, and to ensure community awareness and support for the effective management of Kosrae's resources.

Progress: Project implementation took place beginning on August 15th, 2016 to January 31st, 2019. As was reported in MCT's previous report to NOAA, KCSO was awarded an additional \$10,000 under MACF on this contract and an extension to January 2019 was granted. Numerous meetings and planning sessions were held with the Lelu Community. Once the area agreed to for the MPA was defined, KCSO was able to acquire assistance from the Kosrae Resource Management Authority (KIRMA) to complete the boundary delineation through their Global Positioning System (GPS) division. The GPS data of all three (3) sites were collected to be included in the Lelu MPA management plan. As part of the MPA planning process, KCSO staff held a Traditional Knowledge Workshop on the Lelu MPA Resource Targets with the senior citizens of the Lelu community. The main activity was carried out in a plenary setting where everyone was encouraged to share his or her views, based on their traditional knowledge. The activity tackled all ten resource targets with great insights on traditional knowledge. The main activity was done using flip charts and markers. A total of forty-five (45) participants including three (3) KCSO staff attended the workshop. The draft MPA management plan is now ready for endorsement by the Lelu local government and leadership. On the 13<sup>th</sup> of December 2018, KCSO hosted a Learning Exchange session between the MPA Managers in all the four villages of Kosrae. The event was held at the Small Business Development Center Training Room in Tofol. Invitations were also extended to KCSO's conservation partners which included staff from the Kosrae Island Resource Management Authority (KIRMA) and Fisheries and Marine Resources (FMR). The main purpose of the presentations was to help the participants get a better understanding of ongoing projects such as the Community-based Ecosystem Approach to Fisheries Management (CEAFM), the Crown Of Thorns (COT) Eradication, International Waters -Ridge to Reef (IW-R2R) and also provided information on particular issues like the MPA inclusion process, provided by KIRMA.

#### 11. Micronesia Protected Area Management Effectiveness (MPAME) tool:

The development of modern conservation in Micronesia incorporates many elements of traditional management and has resulted in a variety of innovative co-management schemes, governance structures and strategies unique to Micronesia and even to each of the island jurisdictions. The bulk of conservation efforts have focused on establishing protected areas through community engagement, mitigating immediate threats, and building networks and creating opportunities to increase capacity for various aspects of protected area management. More recently, the direction has shifted to effective planning for these PAs. This shift to conservation planning was driven by such tools as PIMPAC's Guide to Management Planning and TNC's Conservation Action Planning that are joined to form a more unified model of adaptive management. As PA management plans and other action plans are being implemented, site managers continue to seek opportunities to improve their ability to capture the experiences and results of current management actions to use them to adapt, by refining existing strategies or developing new ones. This need to capture results is made evident by regional efforts to standardize the collection of monitoring data and how that data is managed and interpreted to inform management actions. Much like the collection and interpretation of ecological data, the assessment of the context, management structures, mechanisms, and processes that enable PA management is increasingly becoming necessary. In 2013, TNC in collaboration with the PICRC adapted an MPA management effectiveness evaluation tool from Indonesia now known as the Micronesia Protected Area Management Effectiveness (MPAME) Tool. The tool is an excel-based questionnaire that is filled in by an assessment team utilizing the User Guide that was also developed in 2013. It has been tested and implemented in Palau, FSM, RMI, CNMI and Guam and provides a good standardized assessment methodology that can evaluate effectiveness of management across the region. Based on feedback received from project partners, the tool and the user guide required updating to increase its effectiveness.

Progress: Throughout this project period, MCT Conservation Program staff built the capacity of local partners and community conservationists to employ the newly updated version of the tool through in person trainings in the 4 states of the FSM. Through

subgrants, local conservation organizations used the tool to evaluate how effective at least 3 of their current MPAs are in terms of the management levels and performance in the 12 management categories as provided in the MPAME tool. Moreover, the project built the capacity of both TNC and MCT staff with the knowledge to implement trainings on the tool in the 4 states of the FSM. Finally, during the training visits, TNC and MCT staff provided important Project Management training to the conservation organizations to continue to encourage the strengthening of skills at the local NGO level. The MPAME activity is now complete.

#### **IV: Conclusion/Results:**

As a result of collaboration between MCT and its partners, monitoring protocols and the science-to-management framework are well established in the region resulting in emerging policy and legislation at the jurisdictional levels. This important work has resulted in initiatives opposing the unregulated or unmanaged harvesting of sea cucumbers in Pohnpei. It has also led some municipalities to develop their own coastal fisheries management plans to ensure their resources are used sustainably. In Pohnpei, it has helped to extend the grouper closure time to 5 full months. In all jurisdictions, the monitoring and subsequent results have led more communities to request help to develop management plans to establish marine protected areas.

Leveraging the NOAA CA, MCT continues to acquire funds for other projects that are helping communities develop management plans, manage and eradicate invasive species, establish alternative livelihoods projects, and work to reduce unsustainable fishing practices in the participating jurisdictions for the Micronesia Challenge. MCT also continues to work with partners to disseminate information and up-to-date information on eco-system-based management activities, coral reef monitoring, sustainable fishing practices, invasive species management, and sediment reduction, and other related projects to project partners and stakeholders.

Importantly, through this NOAA cooperative agreement, local monitoring programs across Micronesia continue to become much stronger both independently at the jurisdictional level but also as a region. The local programs work together to share lessons learned and synthesize data led by scientists such as Dr. Houk of the University of Guam Marine Lab who have added significant value to the programs and datasets being developed. During this CA, Dr. Houk was able to complete the establishment of a permanent regional online database that will soon be accessible online for the region and beyond. These datasets are not only being used across our region, but are shared with global scientists to understand more thoroughly the local, regional and global trends in coral reef ecosystem health.