

The Future of Our Ocean is in Our Hands:

**An Update on
the Palau National Marine Sanctuary**

Euotelel a Klingil a Debel Belau

Message from the Administrator

As a scientific organization, we have always appreciated the value of quality data in our marine conservation work. While we still place data in high regard, we have also gained a greater appreciation of the importance of broad stakeholder engagement in ensuring the best possible management of marine protected areas (MPAs). In fact, for Palau, sometimes data must take a back seat while stakeholder engagement goes to the front. This lesson became more apparent when the Palau International Coral Reef Center (PICRC) picked up the role of Administrator for the Palau National Marine Sanctuary (PNMS). As long as Palau's marine resources remain intricately tied to our sense of place, identity, and security, effective management of our marine resources cannot be achieved without stakeholder engagement. It is with this understanding that PICRC set out to fulfill its duties for the PNMS.

The PNMS Act was passed in October of 2015, paving the way for preparation towards full implementation five years later in January 2020. A few months prior to full implementation, in June 2019, the law was amended. Several roles for PICRC were among these new changes, including: (1) Administrator to lead its day-to-day operations, (2) outreach, and (3) research. With all the work done up to this point preparing the

PNMS bill into law; discovering gaps in the law; amending the law; and finally, executing its mandates when it went into full effect, it felt like the hardest tasks were over. This, however, was just the beginning.

All the effort done to date, in different activities across various areas, has been critical in building momentum towards full implementation. However, we still have yet to realize the full benefits of the PNMS, including the establishment of the domestic fishery and resulting positive impacts on food security and livelihoods. **“People first through conservation”**, has been one of our annual mottos, and its meaning continues to be a guiding force behind the PNMS implementation. The benefits from the PNMS must be felt by the people of Palau.

Having the groundwork laid down, it is critical that we do not lose momentum, that we continue to build on what has been done, and continue to move forward so we can realize the full potential of the PNMS. And once again, our success in moving forward is dependent on our communities’ full understanding and support for the PNMS. This update highlights activities, progress, and outputs of PNMS since it went into full force in January 1, 2020.

OVERVIEW

Palau’s Exclusive Economic Zone (EEZ), with a total of 500,238 km² (over 300,000 mi²), became a multi-zoned national MPA in 2015, through the Palau National Marine Sanctuary Act. The larger zone, taking up 80% of the EEZ, is called the Sanctuary and is one of only 25 Large Scale Marine Protected Areas in the world. The Sanctuary is a strict marine reserve which prohibits disturbance, alteration, destruction, or extraction of any resource. The sheer extent of Large Scale Marine Protected Areas (> 150 000 km²) presents several conservation benefits, which include the conservation of entire ecosystems, the enhancement of food security, the protection of entire cultural landscapes/seascapes, the support of international cooperation and the enhancement of protected area networks. The remaining 20% of the PNMS is called the Domestic Fishing Zone (DFZ), which, as its name suggests, will support the development of a domestic pelagic fishing zone. Most of the research done in the past has been focused on the shallow near-shore coastal areas of Palau, including our seagrass, mangrove, and coral reef habitats. The development of the PNMS opens an entire new field for pelagic and deep ocean research in Palau.

ADMINISTRATION

In February 2019, a working group of experts, ranging from socio-economists to ecologists to fisheries biologists, was created by PICRC and the Stanford Center for Ocean Solutions (COS). The objectives



of this working group were to: distill and clarify the PNMS legislation; synthesize knowledge about social, ecological, and economic dimensions of the PNMS; conduct new analyses to begin filling knowledge gaps; present informed policy options for achieving desired outcomes, and identify priorities for future research, monitoring, and evaluation. Researchers from all over the world, including our region, studied the available policy and science about fish movement, fishery economics, biodiversity protection, and surveillance and enforcement schemes, to produce a guiding document titled ***Palau's National Marine Sanctuary: Managing Ocean Change and Supporting Food Security: Report of an Expert Working Group Convened by PICRC and COS***, (available at <http://picrc.org/picrcpage/wp-content/uploads/2019/12/PNMS-Act-Overview-2019AUG20.pdf>). This report aimed to help Palau's leaders and implementing agencies make informed decisions and plans related to the PNMS. Of particular importance was the development of a draft science and monitoring plan, which identified priority research for the PNMS.

FINANCE

The PNMS Act expanded the Environmental Impact Fee (EIF) fee for all visitors to Palau, from \$50 to \$100 and renamed it the Pristine Paradise Environmental Fee (PPEF). Five percent of the PPEF, or \$5 for every \$100 paid by visitors, goes to the Fisheries Protection Trust Fund. In addition to the funding from PPEF, the Fisheries Trust Fund also receives fines and fees for violations of the PNMS and fisheries laws of Palau and has received a \$1 million donation to PNMS from the government of the Republic of China (Taiwan).

To date, as of August 2020, \$2,924,436 have been collected. Of this, almost 89% (\$2,300,000) was invested in the financial markets last year in July 2019. From July 2019 to August of this year, the fund has increased by \$159, 756.04. Once this fund matures by reaching 10 million, it will help provide sustainable financing for surveillance, enforcement, training, administration, and eco-tourism for the PNMS.

FISHERIES PROTECTION TRUST FUND

	2017	2018	2019	2020	Total
Fees & fines	175,000	-	-	-	175,000
Republic of China (Taiwan) Donation	500,000	500,000	-	-	1,000,000
PPEF	-	787,857	806,153	152,773	1,746,783
Interest	-	-	2,652	-	2,652
					2,924,436

AWARENESS



In May 2020, PICRC formed a local Communications Working Group to ensure stakeholder engagement, public awareness, and community ownership of the PNMS. The group is composed of members from across different agencies and community organizations within both private and public sectors. The Communications Working Group will develop a set of guidelines, to ensure that new information regarding the PNMS is shared with the public on a regular basis. At the same time, this group will also ensure that community feedback is received and considered. These guidelines will help communicate new information, engage leadership in Palau at various levels, and facilitate information-sharing amongst partners, for effective implementation of the PNMS.

RESEARCH

The following are the three overarching goals behind the development of future scientific research and monitoring of the PNMS:

1. Healthy Ocean Populations and Ecosystems for Palau: Sustaining pelagic marine resources that benefit Palauan livelihoods and drive the Palauan economy
2. Food Security for Palau: Ensuring sustained, nutritious, and safe supply of food for Palauan residents
3. Sustainable Development for Palau: Developing a domestic pelagic fishing industry and supporting existing sustainable tourism initiatives

The establishment of a robust baseline for the PNMS will be integral to determine if this new MPA is achieving the abovementioned goals. Over the past few months, PICRC has been working with various collaborators and stakeholders in the development of both, socio-economic and ecological baseline research.

Socio-Economic Research

1. PNMS Socio-economic fisheries baseline study



A study to develop a baseline understanding of fisheries within Palau was conducted in 2019 in partnership with the University of Hawaii at Mānoa, the Stanford Center for Ocean Solutions (COS) and The Pacific Community. The study investigated the current structure of Palauan fisheries (pelagic versus reef fisheries), conducted a fisheries value chain analysis, and determined the current market demand for fish, between tourists and residents.

The key outcomes of this study included the following:

The supply chain of fish in Palau was found to be quite complex and made up by various actors. Pelagic fish supply was found to be modest

(165-284 metric tons per year) and the majority of reef fish consumption was found to be non-commercial, with 865 mt/year (less than half the total amount of reef fish consumed) entering the local market.

Tourists consumed half of all pelagic fish and only a fraction of reef fish. It is predicted that an increase in pelagic fish prices will shift tourist fish consumption towards reef fish, and residents towards both reef fish and other sources of protein such as chicken. Residents eat far less pelagic fish compared to reef fish, probably because of limited availability and high cost of pelagic fish.

Tourists exhibited a higher willingness to pay for pelagic fish. Limited availability of pelagic fish was identified as a possible reason for the high level of reef fish consumption by tourists. Importantly, this study suggests that implementing a restriction on the consumption of reef fish by tourists will not discourage future tourists. In addition, tourists indicated a high willingness to pay for sustainably sourced pelagic fish, which suggests a potential for developing a local sustainability label for fish in Palau.

The study also found that an unsustainable export rate of 115 metric tons of reef fish were being sent outside of Palau every year. This finding inspired the Olbiil er a Kelulau, Palau's congress, to pass a law that bans the export of reef fish; an incredible win towards conservation for Palau's people and ocean.

This study provided important baseline information on the pelagic and reef fish markets in Palau, which will be used to compare future changes. In addition, future research will focus on the socio-economic implications of the development of a domestic pelagic fishery in Palau, as well as the potential of developing a local sustainable fishing brand.

A summary of the report can be accessed here:

<https://doi.org/10.1016/j.marpol.2019.103754>

Listed below are PNMS-related activities and research projects that have been initiated since January 2020:

2. **Socio-economic benefits of the PNMS**

A socio-economic study to understand how people think and feel about the PNMS, and how it will affect their lives, has been initiated. Specifically, this study aims to develop a better understanding of the human well-being benefits and values of the Palau National Marine Sanctuary. PICRC researchers will survey households in Palau to gain a clear understanding of how the PNMS will provide specific benefits to Palauans. Having this information now will allow us to compare it in 5 or 10 years' time, and determine whether or not these benefits actually happened.



Ecological Research

1. Residency, migratory pathways, and temperature ranges of adult yellowfin tuna in the PNMS



State-of-the-art satellite tracking technology is being used to observe tuna movement to understand whether these fish stay within the boundaries of the Sanctuary, or travel outside of it. The movement data generated by this study will help us determine if the Sanctuary provides important tuna habitat and if the development of this MPA is benefiting tuna populations in the region. We are also tracking how much time tuna, and other pelagic migratory fish, tend to spend in deeper waters, with the purpose of learning more about their temperature preferences. This information can, in turn, help us predict how climate change might affect their migratory patterns.

2. Movement and temperature ranges of sub adult yellowfin tuna within the network of FADs in Palau



Fish Aggregating Devices (FADs) are buoys with anchors which are set out in the deep blue ocean around Palau. These buoys act as magnets for pelagic fish. Different types of FADs around Palau are being studied to determine how much time tuna (usually younger and smaller fish) spend next to them. We can then think about how to build and deploy FADs that are more productive, giving local fishermen more effective tools to catch these valuable fish. The development of an effective FAD network will be integral in establishing a domestic fishery.



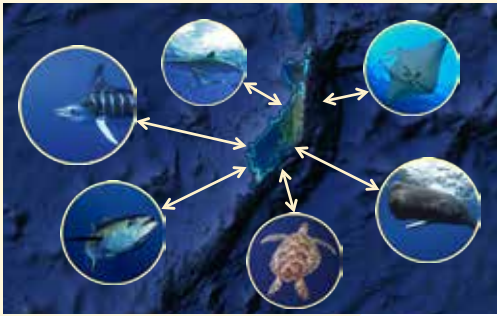
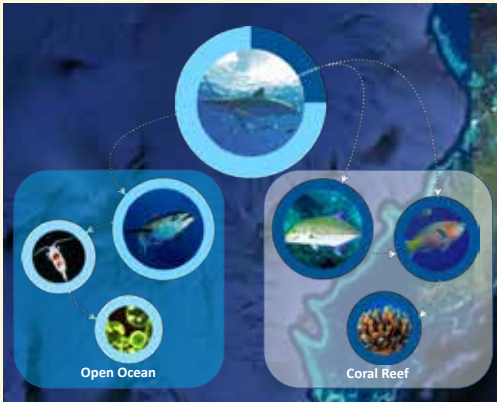
The results of this research are already being used to guide the placement of FADs in Palau. PICRC has been working with the Bureau of Marine Resources, the body in charge of deploying our FADs, to make recommendations to improve the design and placement of FADs, in order to ensure their durability and accessibility to fishermen.

A summary of a recent publication on this research can be accessed here:

<https://www.sciencedirect.com/science/article/abs/pii/S0165783620302058>

3. Understanding the role of mobile marine predators in fostering reef-open ocean connectivity

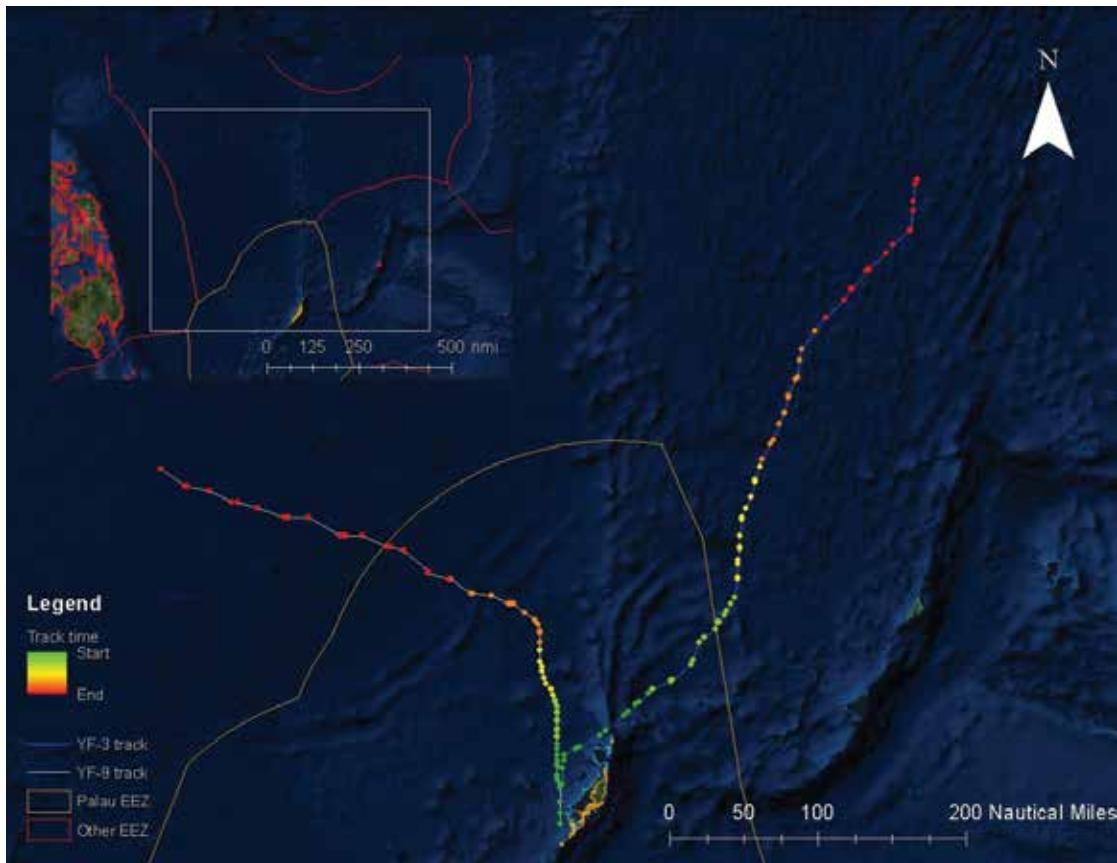
Palau is home to a diverse group of large, predatory fish species, which frequently move between Palau's coral reef habitats and the deeper open ocean, to feed. To determine how the PNMS is connected to the shallow coastal environments of Palau, research is being developed to



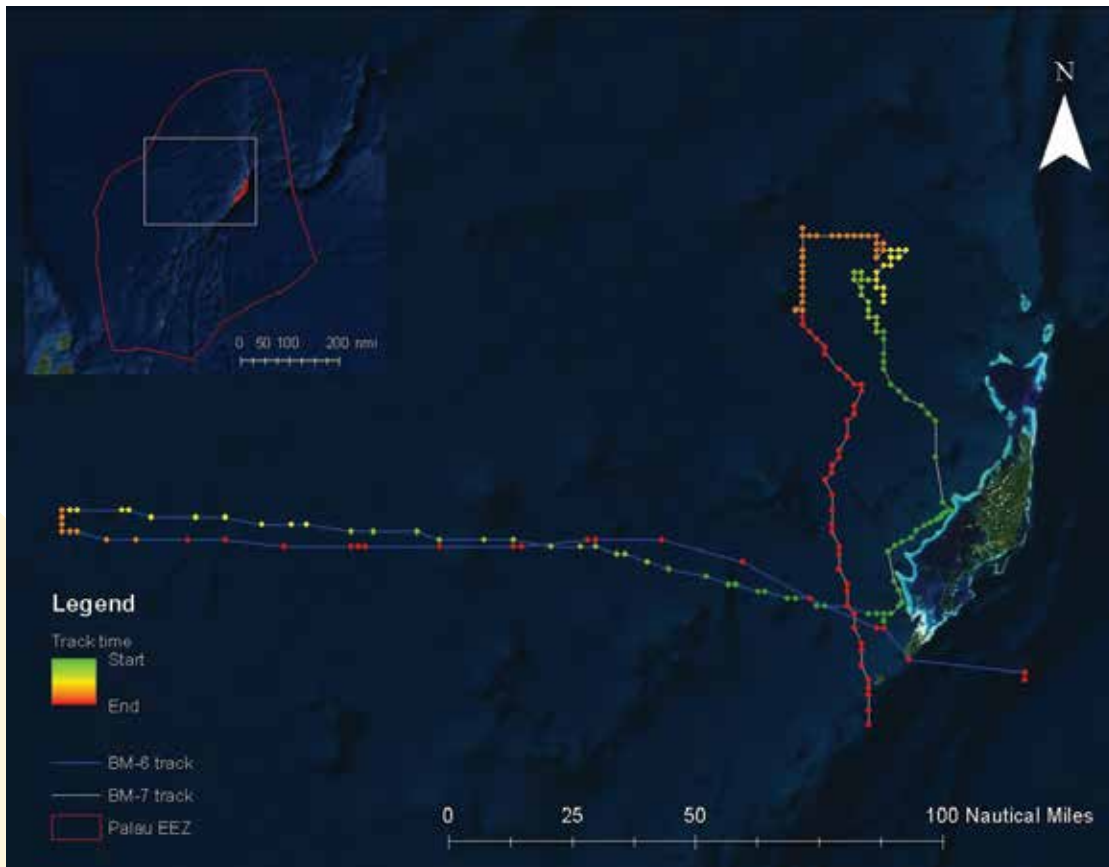
investigate the movement patterns of fish across these two areas. In partnership with Stanford University researchers, we are using chemical analysis of fish muscle tissue to measure how reliant culturally and ecologically significant predatory fish species, such as sharks, tunas, jacks, and groupers, are on reefs, versus open ocean resources. To date, we have collected 174 tissue samples from 16 open ocean species. At the same time, we received 1,139 tissue samples, from 25 reef fish species, from the Coral Reef Research Foundation (CRRF). Chemical analysis of these samples has begun, and we plan to continue collecting additional samples later this year.

This project will reveal which species depend on the interconnection between the PNMS and the shallow reef environments, establishing baseline knowledge of the interdependence that exists between Palau's reefs and its deeper offshore habitats. This information is crucial for evaluating the success of the PNMS, estimating the impacts of shifting fishing pressures, from reef-based to pelagic resources, and predicting the potential consequences of climate change and stock depletions on both predatory fish populations and coral reef communities.

Map of Tuna tracks



Map of Marlin tracks



4. Environmental DNA (eDNA) as a tool to assess marine biodiversity in the PNMS

According to initial estimates, the PNMS is home to 800 marine species. This is, however, probably an underestimate of the diversity that we have in our sanctuary. As a first step to investigate and record the marine diversity within the PNMS, we are going to make use of a novel approach called Environmental DNA (eDNA). This approach looks at bits of DNA within the water (genetic material left over in the environment, which can come from various sources such as mucus, skin cells or faeces). By collecting large quantities of water, and analyzing the eDNA found within the samples, we will be able to determine which species occur in the PNMS. We are collaborating with the Stanford Center for Ocean Solutions (COS) and Palau's Division of Marine Law Enforcement, with funding from the Waitt Foundation, on this exciting new project. This research will provide an important baseline of biodiversity found in the PNMS and expand current information about the ecosystems and natural resources found therein. We are working to secure additional funding that will allow us to examine these DNA samples to detect which organisms are associated with the PNMS, including rare and transient species, and reveal how biodiversity may change over time and location.

The ultimate direct benefit that the PNMS strives to deliver is to create a bigger fish market for Palau, by Palauans. Below is a list of activities and progress made to date, related to the fisheries component of the PNMS:

1. Agreement between the government and local fishermen



The Ministry of Natural Resources, Environment, and Tourism (MNRET) has entered into an agreement with the Belau Offshore Fishers Incorporated (BOFI) to develop a domestic market for tuna and other pelagic fish species. This collaboration aims to establish prices that are fair to consumers, while benefiting local fishers. With support from PICRC and other partners, efforts are underway to build capacity, establish infrastructure and equipment, and set appropriate processes in place to receive tuna, and other pelagic species, from long-line fishing vessels and local fishers, to supply the local market.

2. Capacity building in skills, equipment and infrastructure initiated:



A) Skills

As part of the capacity-building mission, MNRET brought several local fishermen to Japan and Indonesia to observe firsthand how these big fishing operations run. Pre-COVID19, visits were organized to Alaska and Okinawa for local fishers to better understand market chains and key business aspects applicable to Palau. Other arrangements of capacity building efforts include:

- (a) Proper fish handling and techniques;
- (b) Ventures in added-value products in canning tuna marketed to Palau's tourism sector; and
- (c) Strengthening management of FADs, including safety, fishing gear, and best utilized methods when accessing FADs.



B) Equipment and Infrastructure

- (a) MNRET has purchased a 20-foot cold storage container;
- (b) Pole-and-line fishing vessel has been provided by Japan and will be available in 2021;
- (c) Central fish marketplace has been designed and construction is expected to begin soon.

3. **Small grants for fishermen now available through Ministry of Natural Resources, Environment, and Tourism (MNRET)**

The Ministry is also providing small grants through the Pacific Islands Forum Fisheries Agency (FFA) to help fund local fisheries ventures and other needs as well.

4. **Transshipment of tuna at port approved**

Palau passed a law that allows licensed longline fishing vessels to offload their foreign-caught fish in Palau, where more frequent flights ensure consistent quality of sashimi grade tuna for the export market. This change, along with recent changes to the PNMS legal framework related to export, will strengthen Palau's food security by making it easier for MNRET to secure tuna and other pelagics for the local market, when they are needed. These measures are part of Palau's overall efforts to effectively manage the PNMS.