

Integration of fisheries and protected areas management for Palau's northern reefs

Despite notable gains to establish protected areas and promote conservation in Palau, strategies to address declining fisheries in the northern reefs are limited. At the same time, fishing pressure has increased as fishery resources across Palau have diminished. Improved access and better fishing technology — as well as changes from traditional subsistence fishing to commercial fishing — has led to a decline in fishery resources. Other factors contributing to increased fishing pressure include: 1) economic development and an increase in tourism; 2) high per capita fish consumption compared with other regions in the Pacific; 3) high demand for reef fish at cultural and traditional functions, family events and local food markets; 4) access to advanced fishing gear and increased harvesting potential; and 5) the low prices for fish, and market dynamics. Currently, marine protected areas (MPAs) are one of the few fishery management tools available in Palau, and there are issues with enforcement and potentially with the spatial design of MPAs to support fisheries goals. In addition, there is a lack of scientific data to support fisheries management, a lack of participation by fishermen in management, and a very open access fishery with few regulations governing commercial and subsistence fishing.

There is a growing awareness on the part of fisheries officers that protected areas alone are insufficient to address fishery concerns, and that there are limited data to assess stocks, guide fishery management measures, or develop spatial plans to support the rebuilding of fish stocks. A recent data-poor assessment conducted by Dr Jeremy Prince (Murdoch University, Australia) estimates that 60% of fish captured are immature; an estimation reinforced by fishermen's views that fish sizes have decreased.

Palau's states of Kayangel and Ngarchelong have had a long history of working to care for their marine resources. Despite significant efforts to protect biodiversity and marine resources, including the establishment of MPAs, many marine resources and fisheries that are of importance to local communities are exhibiting downward trends in abundance and productivity.

Through consultations and leadership summits, communities in Kayangel and Ngarchelong states have expressed a desire to establish stronger cooperation with regard to the management of fisheries and protected area management under Palau's protected areas network (PAN). With enhanced fisheries capacity, improved understanding of fish stock status, implementation of spatial and non-spatial management measures, community involvement, and better enforcement, it is anticipated that populations of some fish species could be rebuilt within a few years.

Palau's northern reefs, which are north of Babeldaob Peninsula, extend out to Velasco Reef, a 20-mile submerged reef system at the northern tip of the Palauan archipelago. The relatively untapped marine resources in this area — from the low water mark out to 12 nautical miles (nm) — are under the ownership and management of Ngarchelong and Kayangel states.

Ngarchelong State is home to some of Palau's most abundant and productive fishing grounds and marine environments. As part of the northern lagoon, the Ngarchelong Marine Managed Area includes 197 km² of reef, channels, lagoon, mangrove, and open ocean out to 12 nm. The Ebiil Conservation Area was established in 2003 to protect Ebiil Channel and surrounding reefs.

Kayangel is the northernmost state in Palau and one of only two sandy atolls in the country. It is approximately 40 km north of Babeldaob. The PAN includes the 12 nm of nearshore waters of Kayangel (1,685 km²), Ngkesol barrier reef (163 km²), Ngeruangel Marine Reserve (34 km²), Ngeriungs Globally Important Bird Area (0.34 km²), as well as two forest preserves (Chermall Sacred Natural Site and Ngerusebek Sacred Natural Site). The network includes important coral reef habitats (barrier and patch reefs), seagrass beds, turtle nesting beaches, atoll forests, fish spawning and aggregation sites, and breeding areas for seabirds.

Reversing declines in fisheries and other marine resources in Ngarchelong and Kayangel states has been identified by local communities as a key management challenge and a priority.

A partnership involving the Ngarchelong and Kayangel states, The Nature Conservancy, the Palau Bureau of Marine Resources, the Palau Conservation Society, and the Palau International Coral Reef Center has been established to implement a three-year project focused on implementing new fisheries management approaches that are cost-effective, involve local resource users, and can be clearly integrated into PAN management. Some key areas of strategic engagement will be:

- ✓ building capacity for community-based fisheries co-management;

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- ✓ implementing data-poor stock assessments linked to management measures;
- ✓ integrating spatial and non-spatial fisheries management with protected areas management;
- ✓ strengthening enforcement and compliance; and
- ✓ demonstrating economic benefits from improved fisheries and alternative livelihoods.

The vision for the fisheries management project in Palau's northern reefs is to achieve sustainably managed and profitable coastal fisheries where fisheries and no-take reserves are integrated into the management of Palau's PAN, and where fishermen play an integral part in the co-management of fisheries. As a result, local citizens and tourists will have reliable access to abundant fresh seafood. Over time, the network of no-take reserves and improved fisheries management will continue to provide spillover benefits to enhance fishing, marine biodiversity, and the resilience of marine ecosystems and the communities who depend on them, in the face of climate change.

SPC's Fisheries, Aquaculture and Marine Ecosystem Division was requested to provide technical assistance on rearing giant clams (for domestic and export markets) as a possible alternative income-generating activity for isolated coastal communities in Ngarchelong and Kayangel, and to suggest fishing alternatives for local communities in these two states.

In September 2013, SPC's Aquaculture Section assessed the primary needs and expectations of northern coastal communities with regard to giant clam farming, and identified suitable farming strategies and sites for a giant clam nursery and grow-out station. In April 2014,

SPC trained farmers in Ngarchelong and Kayangel on improved farming strategies (e.g. improved floating and submerged systems, and measures to control predators and diseases). As a result of these two missions, around 30 northern families have initiated clam farming activities. It is too early to provide conclusive data on survival and growth rates, but farmers are working hard and clams are growing well.

On the fisheries diversification side, SPC recently conducted a two-week training workshop in Ngarchelong on fishing methods that are not commonly used in Palau. SPC brought John Uriao, a fisherman from Rarotonga, Cook Islands, to show local fishers from Ngarchelong and Kayangel how to catch flying fish, locally known as *kok*. Cruising outside the reef at night, trainees using a high-powered spotlight mounted on a helmet, and scooped up flying fish swimming near the surface with a net mounted on a three-meter-long handle.

The training workshop included sessions on constructing the necessary equipment and nightly fishing trips. Two two-hour-long fishing trips yielded an average of 80 fish. The flying fish were grilled over the fire, fried, and even eaten raw. With a mild flavour tasting slightly like gold spot herring (*Herklotsichthys quadrimaculatus; mekebud*), flying fish are sure to become a sought-after food fish. Flying fish are also good bait for larger pelagic fish such as Spanish mackerel (*Scomberomorus commerson; ngelngal*), barracuda (*Sphyraena spp.; ai*), and dogtooth tuna (*Gymnosarda unicolor; kerngab*). Fishers from Kayangel and Ngarchelong are excited about this new fishery, and Palauans will certainly start looking for flying fish at upcoming night markets. Other prospective markets also exist, such as the Palau Sport Fishing Association (bait for big game fishing charters) and the



Some of the fishermen involved in the flying fish fishing experiments. They hold the two scoop nets constructed during the training. The third gentleman from the left wears the "pink helmet" fitted with a powerful LED-projector that quickly became very popular among fishermen (image: Michel Blanc)

numerous Japanese restaurants in Koror. Those markets will be further assessed while Palau's Bureau of Marine Resources and The Nature Conservancy will ensure that data from ongoing exploratory fishing for *kok* are collected in order to better understand the resource (species, size, spawning time, seasonality) and the economics of this newly introduced fishing technique.

SPC also brought in Carl McNeal, a fly fishing expert from New Zealand to scout for areas in the northern reef area and to assess the potential for fly fishing ventures in that area. Ngarchelong fishers took Carl and SPC Fisheries Development Adviser Michel Blanc to look for potential sportfish along inner reefs, sand flats and mangrove fringes. Saltwater sportfish include species such as bonefish (*Albula* spp., *suld*), milkfish (*Chanos Chanos*; *mesekekat*), trevally (Carangidae; *erobk*, *oruidel*), snappers (Lutjanidae), emperors (Lethrinidae) and groupers (Serranidae). Fly fishing is a popular sport in other places in the world and successful community-based operations already exist in the Pacific. Fly fishing is sustainable ("catch and release") and if managed properly, has the potential to bring in considerable economic benefits to local people. Bad weather prevented extensive surveys, and so other productive areas such as fish aggregation devices, outer reef slopes, and Kayangel Atoll will have to be assessed by local partners. If enough target species or productive fishing areas are found, SPC will train prospective guides on fly fishing and cast fishing, maintaining gear and tackle, tying flies, and the art and skills behind guiding.

It is believed that the development of alternative and non-extractive fishing methods will assist in allowing populations of reef fish to recover from the current heavy fishing pressure. Coupled with increased management



Sashimi dishes of flying fish were trialled at local restaurants in Palau (image: Michel Blanc).

and enforcement, fisheries diversification and aquaculture will contribute towards the ultimate goal of the northern reef project, which is the recovery of coastal fish stocks in Ngarchelong and Kayangel states.

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Saiky Shiro (left) and Carl McNeal searching for "fighters" on the reefs flats (image: Michel Blanc).

