RESILIENCE SOURCEBOOK

Inspired by the 2013 Milstein Science Symposium
Understanding Social and Ecological Resilience in Island Systems
Informing Policy and Sharing Lessons for Management

CASE STUDIES OF SOCIAL-ECOLOGICAL RESILIENCE IN ISLAND SYSTEMS

American Museum of Natural History
Center for Biodiversity and Conservation

BUILDING CAPACITY FOR COMMUNITY MANAGEMENT OF MARINE RESOURCES

Ulithi Atoll, Yap, Federated States of Micronesia

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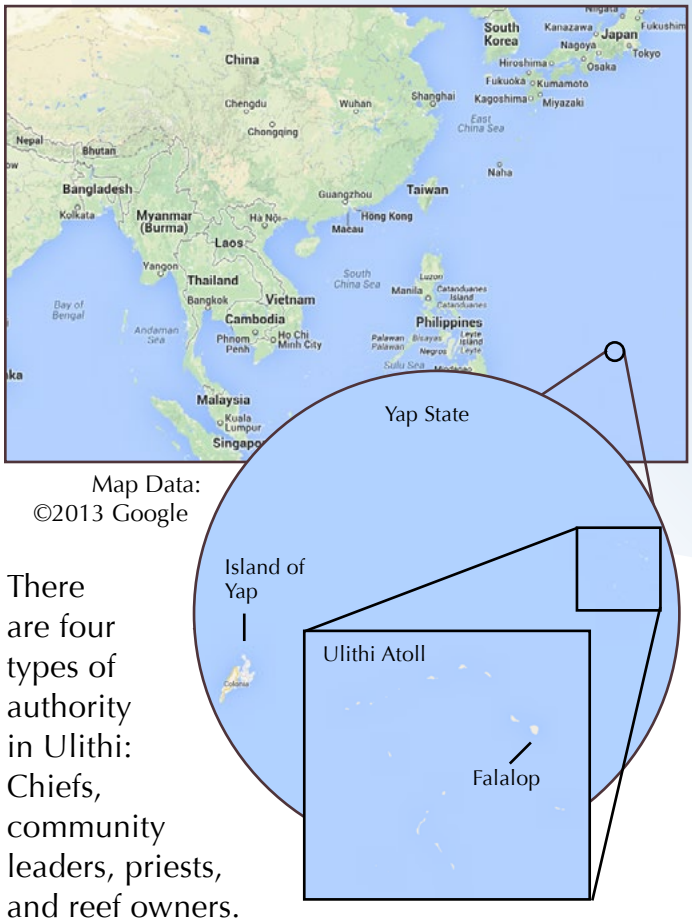
The Setting

Ulithi, a low-lying coral atoll, is comprised of many islets and four inhabited islands: Falalop, Mogmog, Asor, and Fedarai. The main island, Falalop, is located 10° 1'N and 139° 47' E in the Western Pacific. The atoll encloses one of the world's largest lagoons, covering approximately 550 square kilometers.



Map Data: ©2013 Google

Ulithi, with its population of about 1000 people, is under the jurisdiction of Yap, a state in the Federated States of Micronesia. While Ulithi is approximately 165 kilometers from the island of Yap, it depends on Yap State for services such as health care. In principle, the government based in Yap is responsible for managing Ulithi's natural resources. In reality, however, Ulithi acts as an autonomous unit. The Micronesian government passed legislation concerning unlicensed foreign fishing activity, but enforcement is problematic at best. The state of Yap has only two patrol boats that are responsible for patrolling thousands of square kilometers of ocean. The people of Ulithi have accosted illegal fishermen, disrupting fishing and providing some measure of enforcement, but the outer islands of Yap, generally, make decisions on resource management (including enforcement) based on their own needs and values. Ulithi is culturally and ecologically distinct from the rest of Yap.

The people of Ulithi have a complex system for managing marine resources. The traditional approach includes creating temporary no-take areas. These areas act as a sort of savings account, fished perhaps only on a special occasion or after a catastrophic event (e.g., typhoon) destroys other fishing grounds. Fishing areas may also be closed following the death of the head of a family, and re-opened after six months to a year.

There are four types of authority in Ulithi: Chiefs, community leaders, priests, and reef owners. In many cases, individuals occupy several different titles. The ultimate authority is the Chief on the island of Mogmog. Leaders are careful how they wield authority and work hard to achieve consensus before action is taken. The power and influence of the chiefs appears to have waned in the last several decades due to the influence of cash from family members living and working off the island (e.g., Yap, Guam), but there remains considerable respect for these traditional roles.

Ulithi is mostly made up of fringing reef and low islands with a maximum elevation of approximately 1.5 meters. There are no mangroves, but the larger islands are heavily vegetated with shrubs, coconut palms and trees, including breadfruit. The inner lagoon is over 65 meters in depth. There are many reef passes accessing the lagoon, including passes allowing access for large vessels. Offshore the shelf drops off very quickly to depths exceeding 3000 meters

[1] Collaborative Fisheries Research West

Traditional wooden canoe. Photo credit: Peter Nelson

and Ulithi Atoll is less than 200 miles from the Challenger Deep of the Mariana Trench. In fact, the passage between two of Ulithi's Islands, Falalop and Asor is less then a mile wide but drops to over 900 meters deep.

The islands and islets of Ulithi are important nesting areas for several seabirds including the Brown Noddy (*Anous stolidus*). Green Sea Turtles (*Chelonia mydas*) come ashore to lay their eggs in large numbers on the nearby Turtle Islands (Giilab and Yaaor). The main atoll probably once provided important nesting areas for these turtles, but now having them come ashore is a rare occurrence.

The total population across Ulithi's four inhabited islands is a little under one thousand. The most heavily populated island is Falalop. It is the largest of the islands and houses an airstrip, post office, and most importantly, one of the two high schools for all of Ulithi. The high school houses children from other islands of Ulithi, not just from Falalop. When school is in session, the population of the island may nearly double because family members accompany their children to Falalop. Other than this annual move to Falalop, there are no dramatic trends in population in Ulithi. Emigration to the island of Yap, Guam, or the United States is a factor, but the rates appear to be low at present.

Historically, native Ulithians made full use of the available natural resources, relying on fish and invertebrates, as well as sea birds, sea turtles and, to a lesser extent, marine mammals. Agriculture appears, however, to have been their mainstay, with taro, breadfruit, and coconut providing the majority of the nutrition. However, for a variety of reasons, Ulithi has experienced salt-water intrusion into its aquifers, which has rendered many of the taro grounds unusable. With the loss of this agricultural capacity, locals have had to rely even more on marine resources, contributing to overfishing.

Like many remote islands in the tropical Pacific, Ulithi's islands have been heavily influenced by outside cultures. The atoll was "discovered" by a Portuguese navigator in the 1500s and colonized in the 1700s by the Spanish. The beginning of the 20th Century brought German control until the Japanese occupied the islands during World War I. The Japanese abandoned the islands in 1944 and the United States Navy quickly moved in after discovering the inner lagoon could hold more than 700 ships. The atoll and its lagoon were used as a staging point late in World War II, and vestiges of this use remain. For example, when the United States Navy departed the atoll, they left enough army rations (Meals Ready to Eat – MREs) to cover an area the size of a football field and to reach two stories in height. For a number of years, Falalop residents relied almost entirely on these MREs for their daily sustenance, and many became addicted to cigarettes. This

Sea cucumbers are abundant and a potential export fishery. Photo credit: Sam Nelson

reliance on MREs disrupted the previous social structure associated with fishing and reef access, and appears to have contributed to the decline in influence of traditional leaders (e.g., chiefs, elders). In addition, these events eroded traditional ecological knowledge, cultural tradition and kinship relations. Following WWII, the United States held Yap State and other Micronesian Islands as a trusteeship. In 1986, the many island states came together and became the independent nation of the Federated States of Micronesia. While it is hardly unusual that repeated and varied interactions with outside cultures have had powerful

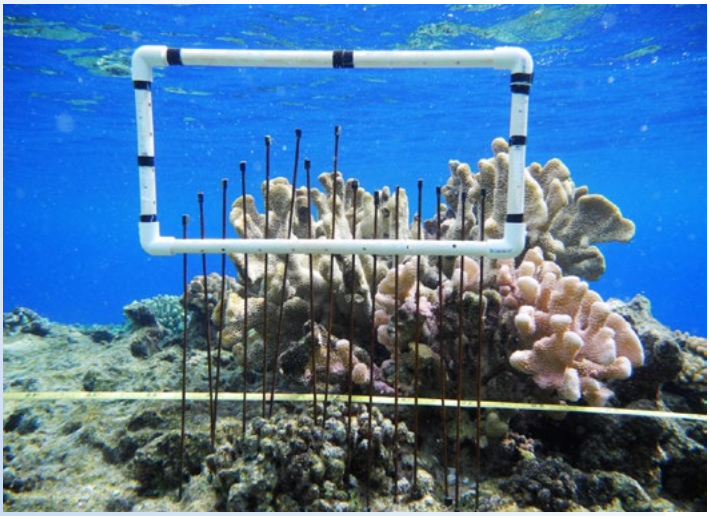
effects on Ulithian society, the environmental consequences, both direct and indirect, have been largely deleterious and cannot be resolved without understanding the social context.

Ulithi's economy is largely subsistence oriented. There are very few wage earning opportunities in Ulithi; exchange is mediated largely through bartering rather than cash. Remittances – money sent to family members in Ulithi from emigrants in Yap, Guam, and the United States – do play a role in enabling Ulithi residents to pay for commercial goods, and a ship delivers market goods (e.g., rice, cotton, fuel) every 4-6 months.

Residents of Ulithi have made efforts to develop a market for some of their handicrafts like lava-lava skirts (hand-woven wrap-around skirts) and baskets woven from coconut fiber. Dried coconut (copra) has also been exported as commercial product and has played an important role in land use and human activities, but is not currently exported, in part due to low prices.

There is a tradition of reciprocity in Ulithi, which means that Ulithi community members will not let anyone go hungry. There is an expectation that families must support those leaving the islands. There is a steady flow of fish out of the Ulithi to Yap and other places.

Supplying Yapese with fish is important to residents in Ulithi, and there is a general understanding



Conducting ecological research, Falalop, Ulithi. Photo credit: Peter Nelson

Community meeting on Fais. Photo credit: Peter Nelson

and agreement on Ulithi that this is necessary to ensure favorable treatment from Yap. Residents of Ulithi are very aware of climate change and the dangers to their home from sea level rise. Everyone understands that Ulithi will eventually be uninhabitable and they will most likely be relocated to Yap.

The Disturbance

Overfishing is an ongoing problem in Ulithi. Once fiberglass hulls, outboard motors, and skiffs were introduced in the 1950s, fishermen could access all parts of the atoll and nearby reefs far more swiftly, safely, and easily than when they were dependent on traditional craft. Monofilament line and metal fishing hooks appeared about the same time, and the documented number of fishing techniques used by resident fishermen went from over a hundred down to five or six. This led to a focus on fewer species. With the more recent acquisition of freezers, fisherman gained the capacity to store and ship fish away from Ulithi.

The establishment of the high school further exacerbated the pressure on marine resources. The influx of residents to Falalop challenged the traditional management system. The seasonal residents are seen as guests and afforded special fishing privileges, exempt from seasonal and geographical restrictions. In addition to this, these guests did not own boats on the island so they were obliged to fish from reef flats, which damaged the corals. These seasonal residents were also forced

Photo credit: Avigdor Abelson

to rely on the more destructive fishing methods like cast nets, gill nets, and night spearfishing (particularly for parrotfish).

Locals noticed a significant change in the populations of indicator species like Bumphead parrotfish (*Bolbometopon muricatum*) and Napoleon wrasse (*Cheilinus undulates*). Though they are still present, these fish are very rare. Groupers (Serranidae family) are also hard to find and smaller in size than previously. Other species groups affected are emperor fish (Lethrinidae family), wrasse (Labridae family), surgeon fish (Acanthuridae family), rabbit fish (Siganidae family), and other parrotfish (Scaridae family). Rabbit fish and surgeon fish are largely herbivorous and are vital in controlling algal blooms. They are also often caught in reef flats, so they are particularly vulnerable to overfishing by seasonal residents.

The Response

The reduction in numbers and size of fishes alarmed people in Ulithi; food scarcity became a growing issue. In 2011, Ulithi communities sought the help of Nicole Crane, a scientist with the Oceanic Society, to assess the situation and propose solutions to this problem. Nicole Crane assembled a team of scientists, including Peter Nelson (CFR West), to return to Ulithi.

Through consultation with the community, the team learned that the fishery is primarily artisanal and used for subsistence. Locals also insisted that they had strong control over their reefs – they made sure that there was no illegal fishing and no encroachment from outside fishermen. Despite the vastness of the atoll, community members insisted they were aware when unknown boats approached their reefs. Community members approach unfamiliar boats with shotguns in hand and demand they leave. When locals come across long-line gear, they cut the lines and collect what gear they can.

Crane's team collected baseline data, including measurements of coral species diversity, habitat complexity, coral morphology, coral recruitment and counts of pelagic and benthic fish species. They collected data on the fish landed, including species, sizes, gender, condition and reproductive state. Tissue samples for later genetic analyses were also gathered. Using these data and and others gathered in consultation with community members, the team shared their findings with the community at a meeting in September 2012. Crane's team outlined measures taken in other, comparable situations to address over-fishing and reef degradation, but made no recommendations as to specific actions. Ulithi communities would decide how or if they would implement management actions.

Following this meeting, Crane's team trained community members in how to collect basic fisheries data and to monitor select aspects of coral health. They provided data sheets, measuring boards, and sample vials, as well as a short reference handbook on protocols. A laptop computer was also left so that data could be digitized and sent to the team back in the United States on those occasions when someone from Ulithi had internet access during a visit to Yap.

Two months after Crane's team left Ulithi, community leaders shut down half of their reefs around Falalop to fishing. Though there was not a complete consensus on the strategy, everyone in the community has obeyed the restrictions. They also banned certain fishing techniques, including cast netting, limited night spear fishing.

Fishing boats at anchor
Photo credit: Peter Nelson

The people of Falalop have also a formal monitoring program to record fish landings and coral status that continues to update the database maintained by Crane's team of scientists. Specifically, they have been looking at growth of a *Montipora* species of coral that is considered an outbreak species. Genetic data is being collected from coral tissue samples.

Results

The community established marine reserves in September of 2012. After a year, the community claims to have seen positive results—larger fish inside the reserve and better fishing on the margins.

Lessons Learned and Recommendations

- *Traditional management practices need to be resurrected*. Traditional management was assumed to have been effective before colonization and occupation. But the imposition of outside cultures disrupted the effectiveness of traditional management practices. The community understands that modern science is important part of management, however there is strong desire to meld strategies and approaches from the West with traditional practices. For example, when Locally Marine Managed Areas (LMMAs) were recommended to the people of Ulithi, it was pointed out that locally managed areas were a familiar concept.
- *Modern science needs to support traditional management practices*. Even skeptics of modern management practices can be convinced they will be effective when the science and modeling behind these strategies are presented in a way that clearly supports familiar traditional management approaches.
- *Community support is essential*. Buy-in from the people that live and work in the area is essential. Conservation is first for those who live there; note that their understanding of what "conservation" means is almost certain to be different from those with a non-local perspective.
- *Start by listening*. When asked to consult on a particular disturbance, do not wade in with a long list of solutions. Start by learning about the state of natural resources in the area in question — and certainly learn about the people involved. Many people think conservation biology should be focused on protecting and restoring organisms or ecosystems, but environmental management is fundamentally about managing humans.

Partners

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As told to Alexandra Donargo.

The Milstein Science Symposium

The collection of this case study and others like it results from the April 2013 Milstein Science Symposium, Understanding Ecological and Social Resilience in Island Systems: Informing Policy and Sharing Lessons for Management. Held at the American Museum of Natural History, the Milstein Science Symposium convened local resource managers, researchers, educators, island leaders, policy makers, and other leading conservation practitioners to examine characteristics, qualities, and processes that may foster resilience for coastal and marine systems as well as explore interactions, linkages, and feedback loops in complex social-ecological systems and what this means for management. The Milstein Science Symposium was organized in collaboration with The Nature Conservancy, the Gordon and Betty Moore Foundation, the National Science Foundation, The Christensen Fund, the Coral Reef Alliance (CORAL), the Scripps Institution of Oceanography at the University of California San Diego, the University of California Santa Barbara, the United Nations Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries, and Small Island Developing States (UN-OHRLLS), and the Wildlife Conservation Society.

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