

Case Studies of Three Economic Incentive Approaches in Marine Conservation



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This document contains summaries of case studies of three different approaches to providing marine resource users with incentives for conservation: buyouts, conservation agreements, and alternative livelihoods. These case studies informed the volume entitled *Economic Incentives for Marine Conservation* (Nielsen and Gjertsen, 2010), available at <http://www.science2action.org>. Please see this companion volume for definitions of the three approaches and guidance on project design informed by analysis of the case studies.

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Photos on cover by Heidi Gjertsen.

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BUYOUTS

i. Mafia Island Marine Park gear replacement, Tanzania¹

Mafia Island, 80 miles south of Dar es Salaam in Tanzania, is home to a diversity of marine life. There are more than 400 species of fish, 5 species of marine turtles, 134 species of algae, and 48 kinds of corals surrounding this island. Much of this wildlife is under threat due to destructive fishing gear and techniques. Prior to 1998, dynamite fishing was a particularly lethal threat, with each blast destroying most coral reefs and fish within a twenty-meter radius (Silva 2006). Since the mid-1990s, fishermen have consistently used small-mesh seine nets, which scrape along the seabed and sensitive benthic habitats. This fishing practice often causes significant damage to coral reefs and seagrass habitats, but more importantly it indiscriminately captures high proportions of juvenile fish. In addition, the fisheries around Mafia Islands face problems of over-exploitation. Most of the estimated 42,000 people living on Mafia Island depend on fishing as their main source of protein, and trading fish to the capital Dar es Salaam is the main source of cash income. Most households have diversified sources of food, but agriculture and business are limited due to low investment capital and poor soil. The depletion of fish stocks thus presents a danger both to local biodiversity and to the future livelihoods of local fishermen.

The need for management of this degraded area led conservationists and the Tanzanian government to take action starting in the early 1990s. At the time, the Institute for Marine Sciences (IMS) and Frontier-Tanzania conducted extensive preliminary ecological and fisheries surveys as the prelude to planning and establishing a marine protected area (MPA) in which fishing practices would be subject to regulation. From 1992, with support from WWF, the government initiated a consultative process of meetings with 11 villages from the southeast of Mafia Island to discuss possible management strategies for the fisheries. Response from the villagers was mixed; the prospect of eliminating dynamite fishing, illegal since 1970 but commonly practiced since the early 1980s, was welcomed. A ban on coral mining (for processing building lime) was less welcome, and the boundaries were seen as being imposed without input from the villagers. A big step was taken in 1994 with the passage of the Marine Parks and Reserves Act, which laid the legal foundation on which to set up marine protected areas in Tanzania. In 1995, the Mafia Island Marine Park (MIMP) became the first marine park in the country. Covering an area of 822 km² on the southeast of Mafia Island, and originally involving 18,000 people in 11 villages, MIMP is one of the largest marine protected areas in the Indian Ocean (Tobey and Torell 2006). The Marine Parks and Reserves Unit (MPRU) of the Ministry of Livestock Development & Fisheries, governed by a multi-sectoral Board of Trustees, oversees the administration of the park, including financing and licensing arrangements within the protected area as well as community engagement policies.

¹ Additional information provided by Jason Rubens (WWF).

Objectives under the MIMP General Management Plan (2000) include conserving biodiversity, promoting sustainable resource use, ensuring community participation in management, developing ecotourism, and engaging in monitoring and research (URT 2000). The management tries to reconcile the needs of all the resource users, and recognizes three main uses for the protected area: conservation and research, tourism, and livelihood sustenance. To help achieve its goals, MIMP implements a variety of programs. First, it establishes village institutions to give community members input in management and monitoring. Second, it defines several management zones. One zone is off limits to fishing to serve as a breeding ground for fish, and the other zones limit fishing to people resident within MIMP or to all fishers who demonstrate that they do not have illegal fishing gear. Third, the MIMP management certifies resident and non-resident users. Fourth, it implements a gear-replacement program aimed at eliminating illegal small-mesh seine nets. Fifth, there is a complementary livelihoods component that conducts trials of income-generation activities other than fishing, such as mariculture, in collaboration with local communities. The parks also implement various programs for monitoring, research, educational support, and raising awareness.

Funding for these programs has, over the past ten years, come from the government of Tanzania, WWF, the World Bank Marine and Coastal Environment Management Programme (MACEMP), the Norwegian Agency for Development Cooperation (NORAD), and the park board's internal funds. The park also earns some revenue from visitor fees. WWF has been the largest single donor to the park since 1999.

The MIMP gear-replacement program seeks to diminish the degradation of the ecosystems by having fishers turn in destructive gear, principally small-mesh seine nets, in exchange for more sustainable equipment. A fisherman who turns in his net receives an interest-free loan to help him purchase materials for sustainable fishing gears, or for materials or training for an alternative livelihood. Examples of non-fishing enterprises have included transportation businesses (both sea and road) and fuel trading. From 2004 to 2006, groups of fishermen who turned in their nets received interest-free loans ranging from US\$4,413 to US\$13,239. The participants in this replacement program say it has played an important role in helping them sustain their livelihoods while conforming to the new regulations against destructive techniques. According to WWF staff in Mafia, about 80% of illegal seine nets have been removed. It also is hoped that some of the fishers who turn in their prohibited nets will embrace the alternative livelihoods that are offered by the marine park.

In the past, law-abiding fishermen believed that the program's targeting of fishermen with illegal, destructive gears for interest-free loans created perverse incentives. The park management has recognized this problem and has increasingly accommodated legal fishers into its program since 2004 (Mwaipopo 2008).

Marine park rangers and village enforcement units conduct monitoring and enforcement of the marine park zones. These enforcement groups are provided with boats and radio transmitters. They are charged with confiscating any illegal fishing equipment and fining fishermen who do not use permits. To date, the enforcement groups have been quick to

catch and fine seasonal and non-local fishermen, but they are invariably more lenient with their fellow villagers.

The combination of zoning, outlawing destructive fishing practices, and monitoring of these rules is meant to provide adequate incentives for fishermen living within the marine park to turn in gear and give up harmful practices altogether. Yet there is evidence that some of the fishermen are simply going outside the marine park to use their destructive techniques. This has led to better ecosystem conditions within the park, but intensified pressure outside. Many villagers feel that the zoning laws impede their livelihood by not allowing them to take advantage of their knowledge about the best fishing locations. The alternative gears from the gear-exchange program are not accessible to all, and although it is the fishers themselves who propose the type of sustainable gear they are given, most complain that the replacement gears are less effective. Alternative gears are invariably operated in smaller groups, which provides less security to the individual in the event of ill health. In one village (Jibondo), fishers complain that replacement gears do not compensate for the loss of access to the no-take zone at Kitutia Reef.

It is difficult to determine the effectiveness of MIMP's gear-replacement program in isolation, since improvements in the condition of marine habitats can be explained by the combination of programs the marine park is implementing. Moreover, the marine habitats in the park are on a trajectory of long-term recovery from both dynamite fishing in the 1980s and 1990s as well as widespread coral mortality resulting from the El Niño coral bleaching event in 1998. There has been improvement in fish stocks and marine ecosystems, according to both local communities and visiting marine experts (Tobey and Torell 2006). Compliance with the rules of the park has been partially successful. Dynamite fishing has been entirely eliminated within MIMP's boundaries, while the amount of illegal seine-net use and coral mining has diminished. However, inadequate human, financial, and technical resources for effective surveillance will limit the extent to which these practices can be eradicated.

Unfortunately, much of the illegal fishing has simply continued outside the park, bringing into question MIMP's impact with respect to the Mafia Island marine ecosystem as a whole. However, a more recent program implemented since 2007 by WWF, Mafia District, and the Fisheries Division is establishing, training, and equipping Beach Management Units (BMUs) in all the villages outside the park. Under fisheries legislation, these BMUs are mandated to regulate illegal and unwelcome fishing activities in their local area. Whilst the program has been well received and actively implemented at the community level, it remains to be seen how effective local management initiatives will be when they come up against powerful and influential parties, from both Mafia and Dar es Salaam, that invest in illegal fishing in Mafia.

Meanwhile, within MIMP, there has been some increase in landings, but the community members living within MIMP's borders report no positive economic or employment impacts from the marine park. Instead, many of them express continued frustration at their inability to effect changes in the management process (Mwaipopo 2008).

Mwaipopo, R. N. 2008. *The Social Dimensions of Marine Protected Areas: A Case Study of the Mafia Island Marine Park in Tanzania*. International Collective in Support of Fishworkers, India, 54 pp.

Silva, P. 2006. *Exploring the Linkages Between Poverty, Marine Protected Area Management, and the Use of Destructive Fishing Gear in Tanzania*. World Bank Policy Research Working Paper No. 3831.

Tobey, J. and E. Torell. 2006. Coastal poverty and MPA management in mainland Tanzania and Zanzibar. *Ocean & Coastal Management* 49(11): 834-854.

United Republic of Tanzania. 2000. *Mafia Island Marine Park General Management Plan*. Ministry of Natural Resources and Tourism.

ii. Morro Bay trawl permit and vessel buyout, USA²

Trawling is the primary method for groundfish capture on the west coast of the United States. Trawling involves dragging large, weighted nets along the sea bottom, which can damage habitat and result in high bycatch. In 1999, Oceana—an international non-government organization (NGO) focused on ocean conservation—launched a lawsuit against the National Marine Fisheries Service, accusing it of failing to designate adequate “essential fish habitat.” In 2000, a judge ordered the agency to prepare an environmental impact statement. Two years later, the National Research Council released a report surveying research on trawling that detailed the negative effects of trawling on seafloor habitat. Its recommendations included closing vulnerable areas of the ocean floor to bottom trawling and reducing fishing outside protected areas.

In July 2003, The Nature Conservancy (TNC) and Environmental Defense Fund (EDF) responded to these events by engaging the Morro Bay-based bottom-trawling industry (fishermen and processors) along the central coast of California to explore a market-based plan to protect the marine environment and help fishermen. The goal was to protect biodiversity and promote recovery of groundfish stocks by establishing large no-trawl zones. TNC and the fishermen agreed to jointly develop recommendations to the Pacific Fishery Management Council (PFMC) for closure of specific marine areas to trawling. In return for industry support for no-trawling zones, TNC would purchase permits and vessels to reduce harvest effort and ease the financial costs of reduced fishing area.

TNC and EDF negotiated with the Morro Bay fishermen and eventually agreed on areas that could adequately protect two-thirds of the biodiversity along the central California ocean shelf by reducing trawling, but also allow some fishing to continue. In June 2005, the PFMC approved the proposal of zones that ban bottom trawling in 3.8 million acres of ocean. The regulations were enacted in May of 2006, and on June 27, 2006, TNC purchased six federal limited-entry trawling permits and four trawling vessels from commercial fishermen.

The buyout sought to reduce the impact of trawling, but TNC also paid attention to sustaining the fishing industry. The objective is to transition to a more sustainable fishery through measures such as gear switching and marketing higher-quality/higher-value fish. The incentive created by the buyout was for fishermen to leave the fishery (giving up trawling permits and vessels) in exchange for direct payments (presumably compensating them for lost future earnings). In addition, the buyout was structured to create an incentive for the fishermen, PFMC, and TNC to work together to implement no-trawl zones. Finally, an additional incentive to reduce trawling effort was the offer by TNC to assist with marketing of sustainably caught fish.

TNC imposed the following conditions on permit and vessel purchases (Bell 2008):

1. Purchases would only proceed upon on closure of the no-trawl areas.
2. Permit values were based on catch history.
3. Retired vessels could not be used in trawling.

² Additional information provided by Merrick Burden (EDF).

4. Sellers agreed not to enter any component of the groundfish fishery for five years.

The Morro Bay trawl buyout achieved TNC's conservation objectives in a manner more or less acceptable to all. This was a cooperative process in which industry, government, and environmental NGOs worked toward solutions, as opposed to the adversarial battles that often characterize fisheries management. The project attempted to ease the economic impacts of no-trawl zones on the fishermen by compensating them for withdrawing completely from the fishery. In addition, the current phase of the project seeks to sustain the fisheries by leasing permits back to fishermen who commit to switching to sustainable gear and practices. This alternative gear will reduce catch volumes, but there are plans to market higher-quality, higher-value fish to avoid losses in profit. Finally, as there is still large demand for fish that can be caught only by trawling, TNC works with fishermen to modify trawl gear and practices to reduce impacts while continuing supply.

The costs of this project are substantial, including the project design phase, the \$3.8 million initial purchase cost, and continuing annual costs. However, the impacts of the buyout on habitat and fish species of the area remain unclear, as results of monitoring efforts are not available. Therefore the cost-effectiveness of this intervention cannot be evaluated. Trawl permit owners in other areas and TNC are interested in pursuing similar deals, but permit allocation issues and cost may be prohibitive.

The Morro Bay trawl buyout is the first private buyout of Pacific fishing vessels and permits for conservation purposes. The lease-back component of the initiative closely resembles the terrestrial easement approach. Although it is not possible to place restrictions on fishing permits, it is possible to lease a permit back with restrictions. In some ways, the central California coast context represented a best-case scenario for this approach (Bell 2008):

- Fishermen were motivated because of depressed prices and economic uncertainty about the future of trawling.
- PFMC was motivated because of the earlier Oceana lawsuit, which held that NOAA had not provided adequate essential fish habitat.
- TNC was motivated because they had already conducted their ecoregional assessment to identify high priority areas.
- TNC and ED had experience in terrestrial easements and the willingness to experiment with the approach in the marine setting.
- A limited-access transferable permit program already was in place with fairly effective governance and enforcement.

Bell, M. 2008. Permit Buy-outs and Conservation Fishing Agreements in California. Presented at *A Private-Sector Approach: Conservation Agreements in Support of Marine Protection*, Bainbridge Island, Washington, June 18, 2008.

*iii. Northern Gulf of California gill net permit buyout, Mexico*³

The vaquita (*Phocoena sinus*) is a small porpoise endemic to the Northern Gulf of California, Mexico. Its known distribution encompasses an area of only about 4,000 km², far smaller than that of any other living marine cetacean species. The main threat to vaquita survival is bycatch in gill nets used for fish and shrimp. The vaquita is particularly vulnerable given its restricted distribution in an area where fishing has long been a primary economic activity, providing the sole source of income for many people.

Despite regulations to protect vaquita and other species, the threat from fishing (both legal and illegal) persists. For years fishermen and other stakeholders have debated the cause of vaquita population decline, while the threat continued to escalate. Although fishermen do not want to catch vaquita, practices within the fisheries did not change enough to reduce the pressure, and enforcement remained ineffective. Numerous regulations, protected designations, and management recommendations have sought to protect the vaquita since the IUCN declared it endangered in 1990. However, a recent paper by Jaramillo et al. (2007) estimates that there were only 150 vaquitas remaining in 2007. Continued failure to mitigate the threat as well as conflicts between government, NGOs, and fishermen necessitated a palatable solution that quickly could remove all nets from vaquita habitat. In 2005, the Mexican government, the U.S. government, and a variety of non-government organizations (NGOs) began discussing the design of a buyout to compensate fishermen for ceasing to use nets in vaquita habitat.

After much discussion about how to implement a buyout of all nets, the Mexican government decided to proceed with an initial buyout and reduce fishing effort as much as possible for 10 million pesos (approximately US\$1 million). The hope was that success at this initial scale would build trust and secure support for a larger buyout. The pilot scheme was implemented in August 2007. Fishermen were given the opportunity to respond to different offered prices for either (a) giving up their net permits (for shrimp or finfish) in exchange for permits for gear that do not harm vaquita, or (b) giving up their net permits (for shrimp or finfish) in exchange for funding to develop a tourism-related business. Sixty-six permits out of approximately 1,400 were purchased. A second buyout took place in June and July 2008. Out of 893 applications submitted, 738 applications were accepted: 52 for switching gears; 138 for full buyouts (alternative livelihood); and 548 for compensation for not fishing inside the refuge for one year. In the second buyout, fishermen were required to relinquish their fishing permit, boat, motor, and nets associated with the boat. The second buyout, while fairly limited as well, was more flexible than the first since it allowed a greater variety of alternative activities in addition to gear replacement. However, hundreds more nets must be removed from vaquita habitat within the next couple of years if extinction is to be prevented.

³ Additional information provided by Catalina Lopez (NOS Noroeste Sustentable), Chris Costello (University of California, Santa Barbara), Alejandro Castillo López (Centro Intercultural de Estudios de Desiertos y Océanos), Ani Youatt (Natural Resources Defense Council), Steve Cox (WWF), Carlos Muñoz Piña (Instituto Nacional de Ecología), Sara Avila (Instituto Nacional de Ecología).

Although it took much time to build support for a buyout, it was finally designed and implemented in a relatively short period of time. A recent surge of commitment from government and elsewhere has led to some optimism on the part of vaquita conservationists. Fishermen express willingness to consider proposals as long as there also is enforcement to keep out illegal fishermen. Stakeholders now generally agree that economic incentives are needed to secure vaquita conservation for the long-run, and there are plans for a multi-component strategy for long-term conservation, including long-term financing. In addition, a joint WWF and TNC team is exploring other economic strategies to complement and augment existing protection strategies. These include concessions, water rights acquisitions, and other incentive-based fisheries management tools.

Many fishermen in the towns of Puerto Peñasco, El Golfo de Santa Clara, and San Felipe—the main towns near vaquita habitat—will not consider a buyout if it entails permanently giving up the option to fish. Therefore, a more appealing option seems to be temporary compensation for not fishing inside the refuge (which does not require relinquishing a permit) and working to develop new vaquita-safe gear. There are efforts underway with the Mexican government, stakeholder groups, and US fishermen and academics to design and test new vaquita-safe gear. The potential for marketing vaquita-safe shrimp is being investigated, which could complement the introduction of alternative gear and lessen the impact of banning nets. In addition, there is interest in establishing microcredit projects to assist the fishermen and their families in transitioning to other livelihoods.

Several issues make not only the buyout but any attempt at vaquita conservation extremely difficult. Alternative economic options are limited, particularly in El Golfo de Santa Clara, where there are few tourism opportunities. Artisanal fishing has gone largely unmonitored in this large area, and there is a long history of illegal fishing. There are numerous government agencies that must cooperate to ensure that the buyout and regulations are implemented and enforced. There are overlapping jurisdictions of various agencies and protection zones, which can be confusing and lead to inertia. In addition, all the agencies suffer from a lack of resources, limiting their ability to implement conservation schemes and enforcement. Finally, the history with the US embargo on tuna from Mexico because of dolphin bycatch has led to mistrust of US government and environmental organizations that offer financial or technical assistance with the vaquita problem. The Mexican government occasionally has stated that this is a Mexican problem that should be free of international intervention and that other countries are attempting to undermine the competitiveness of Mexican fisheries. Thus, vaquita conservation has a long and often painful history. This context and the large number of stakeholders and consensus process have led to slow progress. The current state of the vaquita population requires urgent action, a necessity that is at odds with the socio-political reality.

Jaramillo-Legorreta, A., L. Rojas-Bracho, R. L. Brownell Jr., A. J. Read, R. R. Reeves, K. Ralls, and B. L. Taylor. 2007. Saving the vaquita: immediate action, not more data. *Conservation Biology* 21: 1653–1655.

iv. *Palmyra island purchase, USA*⁴

Located 1,052 miles south of Hawaii, the Palmyra atoll consists of 275 hectares of land and 6,277 hectares of pristine coral reefs enclosing a lagoon rich with wildlife. Palmyra is one of the northernmost atolls in the Line Islands Archipelago in the equatorial Pacific Ocean, and it is one of the largest US atolls. With a maximum elevation of 2 meters above sea level, the atoll was formed by coral growth along the outer edge of an ancient volcano. Because of its geographic location, Palmyra atoll serves as a critical resting stop and nesting site for vast numbers of migratory seabirds and shorebirds. It is situated 5 degrees north of the equator in the inter-tropical convergence zone, where trade winds from the northern and southern hemispheres meet. This zone is characterized by high rainfall, as much as 175 inches per year on Palmyra. As a result of these weather conditions, Palmyra is one of the last locations on Earth harboring rainforests of *Pisonia grandis*, a rare tree found only in wet atoll environments. These forests provide key habitat for several bird species, including the endangered red-footed booby. Palmyra's red-footed booby nesting colony is the second largest in the world, exceeded only by the Galapagos.

The Palmyra atoll supports more than 120 species of coral—three times as many coral species as can be found in Hawaii or the Caribbean, and five times as many species as can be found in the Florida Keys. Other marine species found in the vicinity of Palmyra include melon-headed whales, bottle-nosed dolphins, hawksbill turtles, black-tip sharks, tiger sharks, manta rays, giant clams, and more than 150 recorded fish species. The shores of Palmyra include critical nesting beaches for the endangered green sea turtle. In addition, Palmyra is home to some of the world's rarest species, including the largest land invertebrate, the coconut crab. Threats to the biodiversity of Palmyra include poaching, unauthorized landings, yacht visitations, and ship groundings. The biggest threat is the introduction of invasive exotic species; already the ecosystem has been invaded by alien rats, coconut palm, and various ant species.

During World War II, the Palmyra atoll was used by the US Navy as an airbase and refueling dock with more than 6,000 personnel based there. Activities on the atoll included dredging to construct a seaplane runway and construction of a causeway bisecting the lagoon. Additional dredging took place to connect various islets, increasing the elevation of the emergent lands and greatly reducing water flow throughout the lagoon. Proposed uses for the atoll have included the establishment of a coconut plantation, resort and casino development, shark fishing, a station for off-loading tuna from long-liners, and designation as a nuclear waste repository, but these plans either failed or were blocked by the Fullard-Leo family, which claimed the atoll as private rather than US government property.

In 1947, the Fullard-Leo family finally prevailed in a protracted US Supreme Court battle for ownership of the Palmyra atoll, and the US Navy vacated the premises. When Hawaii was granted statehood in 1959, Palmyra was specifically excluded from the new state,

⁴ Additional information provided by Stuart Sandin (Scripps Institution of Oceanography).

resulting in the only completely privately owned territory in the United States. After the Supreme Court ruling, negative relations with the US military caused the Fullard-Leo family to avoid the establishment of a formal protected area that would place the atoll under jurisdiction of the Department of Interior. However, over time the family did come to feel comfortable working with The Nature Conservancy (TNC) to conserve the atoll. After more than two years of negotiations, TNC and the Fullard-Leo family reached an agreement in 2000 under which TNC purchased the atoll for about \$30 million, substantially less than the original asking price of \$47 million. The US Fish and Wildlife Service (USFWS) contributed \$9 million in financing by purchasing 680 acres of above-water forest lands and 515,232 acres of submerged lands and open water, including approximately 16,094 acres of coral reef habitat. Those areas are a National Wildlife Refuge, while the remainder of the atoll, about a third of the total area, is managed by TNC as a preserve. The island and surroundings are now also part of the Pacific Remote Islands Marine National Monument. TNC and USFWS are pooling their resources to work together to implement conservation plans for the atoll. In addition to the purchase price, TNC budgeted about \$7 million to establish management operations and build an endowment to support management over the long term.

In compliance with the National Wildlife Refuge System Administration Act of 1966, the USFWS has formulated a 15-year comprehensive conservation plan (CCP) for management of the atoll. The CCP specifies acceptable recreational uses of the atoll, such as fishing, scuba diving/snorkeling, photography, and wildlife education and interpretation. In addition to the CCP, a Research Management Plan (RMP) also was developed to specify research goals, objectives, and strategies. An Environmental Assessment, Land Protection Plan, and Conceptual Management Plan were drafted for both the CCP and RMP, and Findings of No Significant Impact were issued shortly thereafter.

In 2003, TNC established an association of 10 academic institutions to form the Palmyra Atoll Research Consortium (PARC), with the goal of conducting research on Palmyra. In 2005, TNC and PARC, with \$1.5 million in funding from the Gordon and Betty Moore Foundation, set up a research station inside the Refuge on Cooper Island with the capacity to accommodate 20 researchers. The housing facilities and research lab complex are supported by a 100,000-gallon freshwater catchment system, 24-hour electricity, and an environmentally friendly septic system. The consortium purchased a 25-foot offshore research boat and a high-volume SCUBA compressor system to expand marine research capacity. Research focuses on topics such as climate change, terrestrial species interaction, rare forest-type preservation, and marine ecology and biodiversity. The research being carried out at Palmyra addresses a number of the research needs specified by the National Oceanic and Atmospheric Administration's Coral Reef Ecosystem Research Plan.

A portion of the cost of research may be covered by small-scale eco-tourism on the island. TNC has been considering efforts to clean up the airstrip and develop tenting grounds on the atoll, but research activity is the priority and the exploration of eco-

tourism opportunities will come second. The Conservancy currently brings donors to the atoll for eco-tourism and bonefishing using catch-and-release methods.

The purchase of the Palmyra atoll is considered by some to be the most important marine protection effort by The Nature Conservancy. The combination of government and private involvement has allowed for efficient management and creative financing. The US Fishery Management Council provided direct financial support by paying close to 25% of the purchase price of the atoll, and also took responsibility for developing the Comprehensive Conservation Plan. In addition, government involvement also provides a legal backstop for conservation initiatives at the site. One concern that arises with respect to government involvement in financing land purchases is that funds ultimately may not end up going toward the intended purpose of conservation. In the case of Palmyra, the court system and the presence of TNC as a partner with a vested conservation interest are sufficient to ensure efficient allocation of funding and effective implementation of management plans.

v. Phoenix Islands Protected Area fisheries license revenue offset, Kiribati

The Phoenix Islands are located in the center of the Republic of Kiribati in the Central Pacific Ocean. Due to their remoteness, they are among the tropical Pacific islands that have been influenced least by human activity. The Phoenix Islands ecosystem includes eight islands and their fringing reefs, deep seamounts, and open ocean. The range of species needing protection is immense—from birds to reef fishes to demersal species to sea mammals. Human presence is minimal, but the islands are threatened by pressure from foreign commercial fishers and transmission of invasive species and improper waste disposal by occasional visitors. These threats demand a management presence and carefully zoned commercial fishing activity.

The project was initiated by the New England Aquarium (NEAq) in partnership with the Government of Kiribati in 2001, and is supported by Conservation International (CI). Although some regulatory protections were in place before 2001, this was the first concerted biodiversity conservation effort in the area. In fact, the past had seen various failed attempts at human settlement and commercial enterprise. The threat of new attempts persists but will be thwarted by the creation of the Phoenix Islands Protected Area (PIPA). The goal of establishing a marine protected area (MPA) to conserve the Phoenix Islands was generated by NEAq and the Kiribati government at the highest levels. The process has met with no objections, save for voices from the Ministry of Fisheries expressing concern about the impact on fishing license revenue. This concern, recognized early on by all parties, was addressed through the concept of a “reverse fishing license”, a phrase coined by the then Minister of Fisheries.

The strategy to protect the Phoenix Islands may be characterized as MPA creation using a fisheries buyout. The Government of Kiribati approved the designation of PIPA on March 20, 2006. In January 2008, Cabinet finalized the PIPA boundaries to define an MPA of 410,500 km². Four different boundary configurations were considered; the largest size was chosen because the resulting boundary was the most rational option with respect to delineation, monitoring, and enforcement, as well as connectivity. A management plan currently is under development and will specify the portion of PIPA designated as a no-take zone (NTZ). The NTZ portion will be a function of the amount of financing generated to offset foregone fishing license revenue. The non-NTZ portion of PIPA will be subject to intensified vigilance to ensure that commercial fishers are in compliance with regulatory requirements and terms of access agreements.

The central feature of the initiative is the creation of a financial mechanism to offset fisheries license revenue foregone by excluding commercial harvesting from a portion of the Phoenix Islands exclusive economic zone (EEZ). In essence, international willingness to pay for marine biodiversity conservation is being channeled to Kiribati in return for protecting this important marine site. To guarantee the flow of revenue replacement over time, the partners will establish and capitalize an endowed fund operated by an independent trust body. This trust will enter into a formal agreement with the government specifying that as long as conservation objectives and management prescriptions of PIPA are met, payments to replace fishing license revenues will continue.

This approach—establishment of a MPA with a NTZ and corresponding financial mechanism to offset lost government revenue—was chosen because the extraordinarily pristine condition of the Phoenix Islands warrants full protection from harvesting pressure. The absence of a local community greatly facilitates the process of MPA establishment with strict protection of the islands and their reefs. However, fishing license revenues are critical to the government budget, so the international community must share the financial burden of forgoing harvests.

It is anticipated that additional benefits will accrue to Kiribati over time from placing PIPA under conservation management. The establishment of a large no-take zone is expected to benefit stocks of various commercial species. PIPA will provide an extraordinary natural laboratory that is likely to attract considerable international research investment, a substantial portion of which will enter the Kiribati economy. The natural assets of the Phoenix Islands are expected to become a notable tourist attraction, which in due course is likely to yield significant income for Kiribati as well. However, at this point the likelihood, amount, and timing of these benefits are difficult to quantify and predict, and therefore are peripheral to the basic quid-pro-quo being presented to the Government of Kiribati. The viability of declaring PIPA as a MPA rests squarely on the prospect of guaranteed payments to replace lost fisheries license revenues.

The size of offset payments will be a function of fundraising success. This in turn will determine the size of the NTZ within the overall PIPA zoning plan. An initial target of \$175,000 per year justifies closing 25% of PIPA to Annual Access licenses; an increase to \$750,000 will extend this closure to US vessels that operate under a separate, long-term agreement that is due to expire in 2013. The frequency of payments remains to be determined, but will likely be either annual or semi-annual.

The project enjoys several strengths—firm government support, dedicated partners, and a scale and scope that have generated international attention. In addition, the remoteness of the Phoenix Islands has protected this site from a range of pressures that can now be preempted by the creation of this MPA. The main challenge, again, will be to raise the financing for the endowment. At the same time, the project must build the human capacity to manage this MPA, and carefully delineate how to deploy a credible and robust monitoring framework to ensure that the fishing activity that does take place meets rigorous sustainability standards. Plans for the near future include securing World Heritage Site status for PIPA. A critical component of future plans is the tracking of trends in catch volumes and access-fee revenues to better calibrate the portion of PIPA designated as a no-take zone for a given endowment size.

vi. St. Croix gill net and trammel net buyout, USVI⁵

Located east of Puerto Rico in the Caribbean, St. Croix is the largest of the US Virgin Islands, an unincorporated territory of the United States. St. Croix has a land area of 214.66 km² and a population of approximately 60,000. The eastern and southern ends of the island are protected by a barrier reef that is habitat for a variety of corals. An estimated 400 species of fish live in and around the East End Marine Park of St. Croix (TNC 2009). St. Croix also hosts nesting beaches and foraging grounds for several sea turtle species, including green, hawksbill, and leatherback turtles. Sandy Point on the southwest edge of the island is one of the most important leatherback nesting beaches in the area. Some 17 species of seabirds make use of East End Park, including shearwaters, tropicbirds, boobies, pelicans, frigate birds, gulls, and terns (TNC 2009).

A number of threats to coral reefs and fish populations in St. Croix have been identified. These include both proximate sources and distant sources, such as a bleaching event in 2005 that bleached approximately 51% of live coral (Rothenberger et al. 2008). There is some evidence of a trend of decreasing coral cover since 2001, and experts believe that run-off from terrestrial sources has not been managed adequately to date (Rothenberger et al. 2008). Additionally, corals have been declining since the 1970s, when hurricanes and disease began to decimate populations of elkhorn and staghorn corals that formerly dominated shallow reefs. The decline continued in the 1980s, when the massive die-off of the long-spined black sea urchin occurred. Overfishing of large herbivorous fish (e.g., parrotfish, surgeonfish) is an issue of concern in the area, as it can cause shifts from coral- to algal-dominated communities (Rothenberger et al. 2008). The gill and trammel net fishery targets large herbivores by placing nets along daily migration routes. Fishers began switching to net fishing in the 1990s as trap landings decreased because of losses from hurricanes and because net fishing yielded higher catch rates and returns. A Caribbean Fishery Management Council fisher census survey in 2003 surveyed 35 gill net fishermen and 9 trammel net fishermen in St. Croix (Kojis 2002). Each fisher owns multiple nets and the majority of net fishers also use other fishing methods. The fishers use mainly wood or fiberglass boats (20-26 feet) and outboard motors, and drive to access points around the island (Uwate and Tobias 2005). As mentioned earlier, parrotfish is the main target species of net fishers, but the gear is non-species selective. Parrotfish is a staple of the St. Croix community, and all the fish caught in St. Croix are consumed locally.

The St. Croix Fisheries Advisory Committee (FAC) recommended a ban on trammel and gill nets in 2002 (Uwate and Tobias 2005). The idea was to implement a buyback simultaneously with a ban on the gear to reduce the economic impacts of the ban. NOAA Fisheries provided \$75,000 through the National Oceanic and Atmospheric Administration (NOAA) Coral Reef Conservation Program (CRCP) to the Division of Fish and Wildlife of the Virgin Islands Department of Planning and Natural Resources (DPNR) for the implementation of a one-time trammel and gill net buy-back. The National Marine Fisheries Service Caribbean Field Office was responsible for ensuring

⁵ Additional information provided by Lisamarie Carrubba (NOAA), David Olsen (St. Thomas Fishermen's Association), William Tobias (USVI Department of Planning and Natural Resources).

the completion of the project. The purpose of the gill and trammel net buyback was to reduce gear impacts to benthic habitat, in particular corals, by facilitating the removal of the gear from the Territorial fishery. Public hearings were held in St Croix regarding the ban and buyout, and fishers expressed a variety of opinions including that nets are not the main source of the problem, the compensation levels from the buyback are too low, and a regulated fishery or temporal closures would be better than a ban.

The regulations were eventually approved in 2006. The US Virgin Islands Commercial Fishing Regulations Chapter 9A Commercial Fishing Subchapter 321-1 prohibits the use of all gill and trammel nets and single- or multiple-wall entanglement nets, with the exception of single-wall surface gillnets for baitfish. Restricted gill and trammel nets cannot be possessed onboard vessels in territorial waters. The penalties for gill and trammel net violations are a \$1,000 fine and confiscation of vessel and equipment.

Controversy continued to surround the ban and enforcement officers were not willing to enforce the ban until the buyback was implemented. From 2006 to 2008, the new Director of Fish and Wildlife conducted a review of the legislation. A proposal supported by the Director and the fishermen involved a quota-based harvest, closed seasons, and non-transferable licenses that would phase the fishery out more gradually over the next few years. On February 27, 2008, the FAC narrowly voted to cease support of the ban, and it supported the gradual phase-out proposal. However, DPNR and the Governor upheld the net ban, and the phase-out proposal was abandoned. The Director of Fish and Wildlife resigned due to DPNR's decision to enforce the gill and trammel net ban. In May 2008, DPNR announced that it would enforce the ban, and the buyback was implemented shortly thereafter.

The Division of Fish and Wildlife used annual gillnet landings data for all licensed fishermen from 1999 to 2003 and presented eight alternative buyback payment schemes to the St. Croix FAC. The FAC's recommended alternative was approved. In the end, nine gill or trammel net fishermen who had harvested 10,000 pounds or more from 1998 to 2003 were partially compensated through the one-time buyback for a total of approximately \$55,000. In order to receive the buyback funds, the fishermen had to turn in their nets to DPNR. Furthermore, all fishermen were prohibited from using gill and trammel nets in USVI through the implementation of the ban with the exception of certain gill nets used to catch bait fish. Those who had harvested 10,000 to 19,999 pounds received approximately \$2,083, those who had harvested 20,000 to 29,999 pounds received \$4,167, and those who had harvested more than 30,000 pounds received \$6,250.

There are approximately ten enforcement officers stationed in St. Croix under the DPNR Division of Environmental Enforcement. The officers are responsible for enforcing regulations in local and Federal waters through a joint enforcement agreement with NOAA. Since the enforcement of the ban began, there have been at least two apprehensions of violators. In 2009, Enforcement Officers arrested six fishermen for the illegal use of gill nets. Two of these fishermen had criticized the ban and buyback at one of the public meetings and another was a FAC member during the time that the ban and buyback were proposed by the committee. Two of the fishermen had received buyback

funds. The fishermen were arrested and charged, and pleaded not guilty and were released on bail. Recently, a case against a net fisherman was thrown out by the judge on the basis that the ban had been illegally promulgated.

This case illustrates some of the challenges of implementing incentive-based conservation mechanisms with a lack of data and attention to the economics of the system. The low level of funds allocated to the buyback may have done little to secure the buy-in of fishermen, given the value of foregone profits from net fishing. It appears that this led to the perception that managers do not understand or appreciate the value of the fishery. It is possible that increasing the amount of funding for compensation could have improved fishermen's support of the buyback. Some viewed the amount as so low that it alienated them. For example, one of the fishermen had been catching 140,000 pounds per year, which would represent revenues on the order of \$500,000 (Tobias 2004). Although the funds were not necessarily intended to replace net fishermen's income, but instead help them transition to alternative gears, it was perhaps not enough to do so. Since other buyouts in the United States have involved compensation that is more closely related to foregone income, this buyout may have exacerbated the perception of fishermen that regulations are discriminatory against non-continental US fishers. Some project implementers believe that the proposal for a gradual phase-out may have been successful had it been considered earlier.

Although a gear ban can be a relatively simple measure to implement and enforce, it does not necessarily address the underlying concern, which is the species or the habitat. A gear ban creates incentives to develop new gears that may be just as destructive, rather than creating incentives to improve environmental sustainability. An example in this case is that since the ban, a new seine net has been developed that has similar impacts as the banned gill and trammel nets. The FAC is reviewing the gear and recommending restricting these nets as well. In addition, ongoing enforcement will be needed, and the enforcement budget may be too low for officers to carry out all of their duties. On a positive note, the fishermen have recently developed a small-mesh seining technique that is as effective for catching the target species, but with lower bycatch.

Another challenge with the buyout was a lack of data to support management decisions. There is controversy over the impact of net fisheries on overfishing and habitat degradation, relative to other sources. Good ecological and socioeconomic data help to justify and implement a buyback. In addition, there is currently no funding dedicated to monitoring ecological or socioeconomic impacts of the ban. In addition, since enforcement of the ban began only in 2008, it is too early to determine whether monitoring trends might indicate an impact.

The gill and trammel net ban ended up being a controversial, lengthy process—from proposals in 2002, until adoption of legislation in 2006, and finally implementation of the buyback and enforcement of the ban in 2008. The buyback originally was to be completed by September 2004, but the process ultimately took four years longer. Much of this delay was unexpected and could not be changed. For example, the Attorney General who was reviewing the legislation died, and his replacement, a new Governor,

and a new Director of Fish and Wildlife who did not necessarily agree with the original proposal and legislation, delayed finalizing the legislation, implementing the buyback, and enforcing the legislation. It has been suggested that the process may have moved more quickly if an outside entity could have been responsible and solely devoted to running the project and the consultation process. The project implementers believe that there are very few similar buyout models to follow, so they did what they could at the time through trial and error. Despite the challenges and conflicts that arose while implementing the gill and trammel net ban and buyback, it finally did succeed in removing the gear from the water. The legislation was adopted, the buyback implemented, and the ban is being enforced. Since the implementation is so recent, time and data will tell if the desired impacts are achieved.

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CONSERVATION AGREEMENTS

i. Galera-San Francisco Marine Reserve, Ecuador⁶

The Galera-San Francisco Marine Reserve (GSFMR), established on October 31, 2008, encompasses 546 km² of near-shore and marine ecosystems along approximately 37 kilometers of coastline in Ecuador's Esmeraldas Province. These systems form one of the five highest-priority conservation areas in the country (Campos et al. 2007), containing a wide range of ecosystems and species, many of which are poorly protected in Ecuador or indeed anywhere else in the world. This area features an outstanding variety of coastal and marine habitats including mangroves, estuaries, rocky reefs, and coral patches, with high levels of biodiversity. It is one of the few areas in coastal Ecuador where it is possible to find tropical forest very close to the seashore. However, these ecosystems are threatened by overfishing, habitat destruction, deforestation, pollution, and uncontrolled coastal development. Local residents are strongly dependent on natural resources for their subsistence, and artisanal fishing is one of their main activities. Unsustainable fishing practices, including high bycatch rates and extensive trawling activity by industrial vessels from elsewhere in Ecuador, have resulted in the collapse of marine resources, jeopardizing the biodiversity of the area and the wellbeing of the local communities.

Until recently, there was little formal conservation effort in the GSFMR area. Ecuador's Ministry of the Environment and the Ecuadorian non-government organization (NGO) Nazca are deploying a two-pronged conservation strategy for the area: (1) create a marine protected area to ensure sustainable management of resources and (2) combine better management with a conservation agreement that would help local residents benefit from choosing conservation. Given that sustainable management is anticipated to generate larger future returns as a result of reduced harvest (and thus income) in the present, the conservation agreement is intended to enable fishermen to choose the more sustainable option by providing benefits to offset short-term losses. Effective management of resources is envisaged to result from both the formal management of a protected area and from strengthening resource rights for local residents under the aegis of the MPA. Although the MPA has been declared, final zoning and fishing regulations are still being negotiated.

In February 2010, Nazca and Conservation International (CI) signed preliminary agreements with the Marine Reserve development committee and the Galera fishermen. The development committee comprises all the delegates of villages, parishes, and local NGOs involved in planning the MPA, and is responsible for the development and implementation of the protected area's management plan.

Under the agreement with the Marine Reserve development committee, the parties will design and implement a community communication program to promote the Marine Reserve, which also will be part of the Management Plan. In return, Nazca is assisting

⁶ Additional information provided by Soledad Luna (Nazca), Margarita Mora (Conservation International), Roberto Ulloa (Conservation International).

with the creation of a seed fund to build capacity for the Marine Reserve development committee to operate as an organized group. Capacity-building activities include organizational development, strengthening proposal-writing skills, and participation in conservation and management of the Reserve. In the future it is envisioned that the fund would support the coordination activities carried out by the development committee. The seed fund will be established through the sale of products such as T-shirts and local handicrafts under the brand El Tumbo.

Actions under the fisher agreement include mapping fishing areas for marine reserve zonation, designing and implementing fisheries rules, and providing support in the development of a socioeconomic and fisheries monitoring system. In addition, Nazca will assist with strengthening the fisher cooperative through building a legal constitution and capacity building for the establishment of a financial plan that would allow the cooperative to cover the costs of regular meetings with its members, participating in the Marine Reserve meetings, and promoting the cooperative.

These steps will feed into the development of the Marine Reserve management plan. The zoning information will be used to establish a conservation agreement focused on the protection of key ecosystems and species identified in the management plan. This initiative strives to establish a clear quid pro quo of benefits in return for verified conservation commitments. Benefits initially discussed have included legalization and strengthening of the fisherman cooperative, capacity building, equipment, training, and wages for patrolling. Future conservation commitments may include exchanging monofilament gill nets for lobster traps, respecting no-take areas and fishing regulations, and effectively patrolling the Marine Reserve.

This case presents an interesting situation where management of local practices is needed to prevent overharvesting and destructive practices, but where perhaps more significant threats are presented from non-local fishers. In 2010, the government of Ecuador ratified a prohibition on trawling within eight nautical miles from the shore, and trawling was prohibited in protected areas. This legislation gives the opportunity to artisanal fishermen to manage their resources, but within the Marine Reserve a mechanism is needed to empower locals to manage their own fishing activities and enforce rules pertaining to commercial fishermen. However, surveillance and enforcement activities against powerful outside fishing interests requires support from national authorities, including the navy. Therefore, the MPA is governed by a multi-institutional management committee that includes the Ministry of the Environment, Ministry of Tourism, Ministry of Defense, and Fisheries Undersecretariat of the Ministry of Agriculture, Livestock and Fisheries, in addition to local communities and other supporting NGOs such as Nazca, Conservation International, The Nature Conservancy, and Fundación Futuro Latinoamericano.

The establishment of a MPA to protect Galera-San Francisco met with local community support, but it implied recurrent costs of enforcement as well as some restriction of local activities, which would entail opportunity costs. Therefore an incentive agreement was viewed as an appropriate means to make it viable for the communities to establish, manage, and enforce a marine protected area. As the process continues to gain

momentum, ideas are being generated on how to both ensure effective management and use the conservation agreement to facilitate important but potentially costly activities. For example, it has been proposed that provision of resources to support effective local management (e.g., patrol vessels, fuel, resources to the navy specifically for this purpose) could be provided to resident communities on an annual basis, conditional on them meeting agreed upon local management responsibilities regarding artisanal fishing (e.g., management plan, enforcement of local rules, complying with closures).

Conservation International is seeking funds for an endowment to complement government funding to ensure the provision of MPA-related benefits to local communities over time. Until now, CI-Ecuador, the CI-East Tropical Pacific Seascape Program, and the CI-Conservation Stewards Program have provided technical and financial support to Nazca for the establishment of preliminary agreements and are supporting the establishment of a pilot agreement in the Marine Reserve. The goal is to keep supporting the implementation of the agreements during the next couple of years, allowing time for the endowment to be established.

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ii. *Helen Reef community fund, Palau*⁷

Hocharihie (also called Helen Reef) is located over 500 km south of the main islands of Palau and 65 km east of Hatohobei (Tobi) Island, at 2°43'N/ 131°46'E. Helen Reef has some of the highest known hard-coral diversity among Pacific atolls, and is culturally and economically important to the people of Hatohobei. Benefits include cash income from trochus and live grouper trading, and consumption items such as fish, sea turtles, and seabirds. In recent decades, Helen Reef has also attracted foreign fishermen in search of valuable marine commodities. Exploited by foreign fishermen and impacted by locally driven unsustainable harvesting, some of Helen Reef's key resources and habitats are showing signs of degradation.

Although the atoll is large—25 kilometers long and nearly 10 kilometers wide—the land area is quite small at approximately 20 to 40 meters wide and 400 meters long. In 2001, the Hatohobei State Government and its people implemented a pilot surveillance program to protect the reef under the Helen Reef Management Act. This established the Helen Reef Reserve and a Helen Reef Management Board. The Helen Reef Reserve covered approximately 163 km², comprising all land and marine areas within one nautical mile of the seaward edge of the reef. However, this effort was conducted on a three-year trial basis, and the law has now lapsed, principally due to funding constraints. Nevertheless, the people and government of Hatohobei are trying to maintain the area as a no-take zone despite the absence of legal conservation status, and the Management Board continues to operate, actively seeking means by which to bestow permanent protected status on Helen Reef.

In addition to exceptional marine diversity, Helen Reef is also a globally significant bird rookery and turtle-nesting site. Helen Reef supports some of Palau's highest densities of foraging green and hawksbill turtles (*Eretmochelys imbricate*) and one of the largest nesting seabird colonies in Micronesia, including brown and red-footed boobies (*Sula leucogaster*, *S. sula*) and great and lesser frigatebirds (*Fregata minor*, *F. ariel*) and several tern species. Blue-footed boobies nest around the perimeter of the atoll. Finally, Helen Reef is believed to be an important source of coral larvae for the Coral Triangle region. Thus, Helen Reef may contribute to the ability of Coral Triangle sites to recover from disturbances such as bleaching events.

All atoll islands are threatened by global warming and ensuing global sea level rise. The more immediate threat to Helen Reef is posed by unsustainable harvesting practices, mainly from extraction by foreign fishing vessels but also from local resource users who face increasing cash needs. A third threat is posed by invasive species, especially the *Monomorium destructor* ant species that threatens invertebrates and also likely impacts seabirds and turtles. More broadly, Helen Reef suffers from insufficient conservation management. The Helen Reef Management Act served as a pilot effort to address this issue, but the local community, conservationists, and national and regional agencies have had limited success in effecting robust management over the long-term. Management

⁷ Additional information provided by Mike Guilbeaux (Community Conservation Network), Wayne Andrews (Helen Reef Management Program), Sebastian Marino (Helen Reef Management Program).

challenges include conservation planning, monitoring/enforcement, and reliable financing, but the greatest challenge may be reconciling conservation management with socio-economic needs of local communities.

Efforts by the people of Tobi to manage and protect Helen Reef were strengthened by close collaboration with the Hawaii-based NGO Community Conservation Network (CCN). The many notable accomplishments of this partnership include the following (Andrews et al. 2006):

- A comprehensive survey of biodiversity and marine resources at Helen Reef.
- Creation of a base map for future GIS mapping and information management.
- Adoption by the Hatohebe State Legislature of the Helen Reef Management Act in 2001/2, establishing the Helen Reef Conservation Area and the Helen Reef Management Board. (Note: Main conservation provisions were implemented for a three-year interim period.)
- Creation of a draft management plan.
- Training of Tobians in SCUBA diving, resource monitoring, and data recording.
- National and State authorities have entered into a memorandum of understanding to empower officers with the authority to enforce both National and State law in the area. Tobian conservation officers are based on the island to prevent illegal incursions by foreign fishing vessels.

Despite these achievements, long-term sustainable financing remains a challenge. The program relies on short-term grants from a variety of sources and periodically faces severe funding constraints. CCN and the Helen Reef Management Board explored alternative livelihood options, but these proved unworkable largely because of the remoteness of Tobi State. Generally, the search for long-term financial solutions faltered, leading the Helen Reef Management Board and its Chairman in 2006 to pursue new partnerships with two other NGOs, Conservation International and Natural Equity, attracted by their espousal of the conservation incentive agreement approach. Since then, efforts have focused on securing short- to medium-term funding to ensure that project activities can be maintained and to provide a window of time during which long-term arrangements can be structured, including the establishment of a permanent MPA and an endowed trust fund to support management and community benefits. The incentive agreement strategy for Helen Reef comprises two main areas of activity:

1. Addressing economic needs of the local community: As noted, unsustainable harvest practices by local community members are driven by growing cash needs. This source of pressure will be addressed through a community conservation agreement, under which the local community explicitly agrees to forego resource exploitation in return for a stream of benefits to offset foregone income. This approach follows the strategy employed by CI and Natural Equity in community conservation agreements elsewhere. Implementation of the agreement will involve key roles for the State government, the Helen Reef Management Board, and local community members. Crucially, the benefits will be contingent on verified compliance with the agreement.

2. Responding to exploitation by outsiders: Exploitation by outsiders must be addressed through more conventional marine protected area strategies—monitoring and enforcement by appropriate authorities. Deploying robust monitoring and enforcement systems may require some further investment in capacity building and technical support, but can build extensively on conservation accomplishments achieved to date, including training, investments in infrastructure and equipment, and relationships with national law enforcement agencies.

These two areas of activity share a need for a long-term sustainable financing mechanism, to ensure the supply of benefits over time under the community conservation agreement and to support monitoring and enforcement efforts. The project intends to address this need by way of a dedicated endowment, capitalized to a level such that annual returns are sufficient to cover recurrent costs of the community agreement and MPA management. Estimating the needed capitalization for such an endowment will require additional analysis, particularly with respect to community benefits. In 2003, the Helen Reef Management Program and Community Conservation Network presented an estimated management budget requirement of \$113,500, covering program staff salaries, fuel costs, and site operations and maintenance costs. This figure would suggest that an endowment on the order of \$3-4 million, generating about \$150,000 to \$200,000 per year, may be sufficient to cover both community benefits and management costs. However, this figure is subject to further analysis.

Although a number of parties have sought to ensure that Helen Reef is conserved, these efforts have not yet resulted in secure, long-term, effective conservation status. An important reason for this situation may be seen in difficulties encountered by others seeking to establish protected areas elsewhere in Palau. For the most part, these efforts have yet to show results, largely due to the lack of incentives for resource users to offset economic losses caused by conservation efforts. Therefore, the conservation agreement approach, which explicitly addresses this opportunity cost to reconcile conservation needs with local economic needs, is considered particularly suitable for the Helen Reef context. Success in this instance would also provide a model for effective conservation elsewhere in Palau.

Andrews, W., S. Atkinson, M. Guilbeaux, A. Wong. 2006. *The Helen Reef Management Plan DRAFT*. October 24, 2006.

*iii. Jamursba Medi scholarships, Indonesia*⁸

Jamursba Medi is a series of three beaches covering a 20 km stretch on the north coast of Bird's Head peninsula in Papua, Indonesia (formerly Irian Jaya), lying approximately 200 km northeast of the nearest town, Sorong. The beach borders the Pacific Ocean to the north and Tamrau Mountain to the south. Two villages are located next to the beach, Saubeba at one end and Warmandi at the other.

Jamursba Medi hosts the largest remaining leatherback nesting population in the Pacific, and portions of the beach are also used by nesting green, hawksbill, and olive ridley turtles. Together with a nearby beach (Warmon), this site accounts for approximately 75 percent of nesting sea turtles in the western Pacific (Dutton et. al 2007).

Since 1993, WWF-Indonesia, in collaboration with the government's nature conservation agency, has been working with the communities of Saubeba and Warmandi to protect nesting leatherbacks at Jamursba Medi beach. WWF employs local villagers to patrol the beach and collect nesting data. There have been several attempts by WWF to create forest and marine protected areas in this area, but lack of local government action and conflicts within the villages have prevented official designation. However, in 2005, the nesting site, hinterland forest, and adjacent marine area became a district-managed protected area under local government decree. Implementation of the protected area will require consultation and preparation of a management plan, as well as enforcement.

In addition to direct project employment for villagers (patrolling and data collection), attempts in the past to create incentives for turtle conservation have included small-scale alternative livelihood projects. However, these initiatives, such as palm-sugar production, all failed. Thus, benefits from the conservation project only accrued to the 24 patrollers receiving salaries. This caused tension in the village, and conservation project staff recognized that the situation was threatening the future of the project. Villagers who did not receive wages from patrolling were giving up use of turtle eggs without anything provided as an alternative. In addition, villagers have felt neglected by the international community that only directs its attention to the welfare of turtles rather than humans. The communities' commitment to forgoing egg harvest was waning as of 2004, due to this lack of benefits from conservation (some of which had been promised for many years). A stakeholder meeting in 2005 addressed these concerns and considered options for creating long-term incentives for leatherback conservation.

Based on these discussions and priorities identified by villagers, WWF began compensating villagers for opportunity costs by distributing benefits more broadly. In 2005, WWF donated a 40-horsepower outboard engine and wooden longboat to the villages as compensation for their involvement in conservation work. In 2005, WWF also developed a collaborative agreement with SEACOLOGY to provide 13 three-year scholarships for village students (worth \$23,000) in exchange for establishing a no-take reserve encompassing a 280-acre leatherback turtle nesting beach and 160-acre fringing forest reserve at Saubeba and Warmandi villages. In the reserve, no hunting, cutting,

⁸ Additional information provided by Tetha Hitipiew (WWF-Indonesia).

gathering, farming, or any other activity that changes the natural state of the beach and fringing forest is permitted for a period of five years. An academic committee was created for the scholarship program to choose recipients and review performance. In 2006, 13 students were chosen for scholarships based on their grades. The award pays for full schooling costs, such as fees, books, uniforms, and transportation. Students must maintain their grades to continue receiving scholarships; to date, two high school students have dropped out of the program. The recipients' families provided statements pledging their commitment to protecting the turtle nesting beach and forest habitats. If a family is found poaching eggs, they no longer will be eligible for participation in the scholarship program. The creation of the academic committee launched collective action of villagers, providing an institution that also can deal with other community issues. Village elders, landowners, and leaders have also signed a statement ensuring their commitment to protect the nesting beach and forest reserve. In August 2007, the villages agreed to protect an additional 2,031 acres. The larger protected area includes 25 kilometers of turtle nesting beach going 300 meters back into fringing forest.

The conservation program at Jamursba Medi has been successful at curtailing human predation of eggs for fifteen years. WWF plans to continue the scholarship program, contingent on funding. Recent evidence of low hatching success due to predation, erosion and inundation, and high sand temperatures indicates that further activities to boost hatch success are needed. Future management at Jamursba Medi will focus on addressing the impact of predation, inundation, and beach erosion, including further research and strategies to maximize hatchling production. Finally, WWF has indicated a need for education and awareness campaigns to boost leatherback conservation.

The sustainability of the project critically depends on continued support from the communities. This support periodically has wavered in recent years, due to perceived lack of benefits from conservation and development promises that were not delivered. The project has made some attempts to improve the distribution of benefits to the communities. Although the distribution of benefits has improved in recent years with the scholarship program, there remain opportunities for strengthening these incentives, such as by expanding the number of children receiving school fee support.

The incentives that do exist are not based on verified conservation outcomes. In fact, conservation outcomes have not been measured adequately until recently, as only the number of nests was measured, rather than the number of hatchlings. Recent evidence of low hatching success indicates that the hatchling output of these beaches has been much lower than previously expected. A more formalized incentive agreement in which benefits are contingent on conservation behavior/performance could improve the effectiveness of the project, particularly if conservation commitments are explicitly targeted to address the principal threats. Improved data collection and project oversight will contribute to better measurement of impacts from the project. Currently, it is not clear precisely what the project is producing in terms of impacts on the turtle population, at what cost, and which specific activities are most important.

Finally, there is a need to build institutional capacity and secure long-term funding for this project. Its remote location presents a challenge for provision of institutional support and oversight that are necessary for effective project management. Given the social, cultural, and political differences in this part of Indonesia, managing community relations should also be an important component of project management. Several levels of coordination are necessary between project funders, project managers, and the villagers. There is interest in greater community control and management of the project, which will require a great deal of additional capacity building for project reporting, bookkeeping, and other tasks. An office in a city such as Sorong will continue to be necessary while the villages lack communications and electricity. The lack of capacity is in part due to the past state of funding, which has been short-term and not sufficient to implement the full range of needed activities. With the recent Coral Triangle Initiative, the funding issue may be less severe, but challenges remain.

Dutton, P.H., C. Hitipeuw, M. Zein, S. Benson, G. Petro, J. Pita, V. Rei, L. Ambio, J. Bakarbessy. 2007. Status and genetic structure of nesting populations of leatherback turtles (*Dermochelys coriacea*) in the Western Pacific. *Chelonian Conservation Biology* 6(1): 47-53.

*iv. Laguna San Ignacio community development fund, Mexico*⁹

Laguna San Ignacio is situated on the Pacific coast of Baja California Sur, Mexico, 500 miles south of San Diego. The 80,000-hectare lagoon forms the southern boundary of the Vizcaíno Desert. Laguna San Ignacio, the only lagoon in Baja California that remains virtually pristine, is the world's last untouched breeding ground for Pacific gray whales. More than half of the world's gray whale calves are born inside Laguna San Ignacio and the neighboring lagoon of Ojo de Liebre (Agersted 2006). Thousands of gray whales make an annual 10,000-mile voyage from feeding grounds in the Arctic Circle to the warmer waters of Laguna San Ignacio to calve and rear their young before journeying back to Alaska in the spring. In addition to providing gray whale habitat, Laguna San Ignacio hosts at least 221 species, including numerous birds, green sea turtles, and bottlenose dolphins.

In 1994, Mitsubishi proposed to establish a salt plant at Laguna San Ignacio. The proposal was eventually defeated in 2000 through the efforts of local and international non-government organizations (NGOs), but coastal development pressure continued to threaten the area. To conserve the area over the long term, Mexican NGO Pronatura suggested the option of an easement, which would come with the enforcement power of Pronatura lawyers. A conservation easement is a voluntary legally binding agreement between two parties in which the land-use rights of one party are restricted, with the objective of preserving in perpetuity natural resources, scenic beauty, or historical and cultural values of the land. In 2005, the Laguna San Ignacio Conservation Alliance established a 120,000-acre conservation easement comprising all the communal lands within the ejido¹⁰ Luis Echeverría Alvarez on the southern shore of Laguna San Ignacio. This is the largest property to be placed in a private land trust in Mexico and the first time a private land trust has been negotiated for an ejido's entire territory.

There are four parties to the agreement, each with a specific role. Ejido Luis Echeverria agrees to limit coastal development. Pronatura monitors compliance. The International Community Foundation (ICF) is a San Diego foundation responsible for disbursing funds to Ejido Luis Echeverria. They maintain a trust fund and manage it as a third party, so there is transparency and accountability. Maijanu is a NGO that was created in Ejido Luis Echeverria to receive and manage the funds disbursed through the easement.

Pronatura conducts monitoring of the area to determine compliance with the terms of the easement. Twice each year, a team of biologists, GIS experts, and lawyers from Pronatura visit the area to survey the terrain and interview people. Pronatura then reports

⁹ Additional information provided by Raul Lopez (Ejido Luis Echeverria), Fernando Ochoa (Pronatura), Saul Alarcon (WildCoast), Ani Youatt (Natural Resources Defense Council).

¹⁰ Ejidos are a form of communal landholding created under Mexico's 1917 Constitution to distribute property among landless Mexicans. Until the early 1990s, all land was communally owned by ejidos or by the federal government. In 1992, an amendment to Article 27 of the Mexican Constitution made it possible to privatize communal land, giving ejido members the chance to acquire their own land and sell it. Ejidos are now comprised of both communal lands that are shared in equal percentages by all members, as is decision-making, and private land, some of which is entirely private and some of which (private parcels) requires ejido agreement for decisions.

back to ICF with a determination of whether the parties have met the terms of the agreement. If Pronatura determines that the ejido has met its obligations, ICF will disburse to Maijanu the annual interest generated from the Ejido Luis Echeverria Alvarez Seed Fund, which is capitalized in the amount of \$650,000. These annual payments amount to approximately \$25,000 per year. The ejido chose to use the payments for community projects rather than divide the funds as individual payments to members. The payments can be used for any community development projects that are not harmful to the environment and that do not contradict the terms of the contract. Every year, any member can present a project proposal that will be reviewed by the ejido leadership, and all the members vote in a general assembly for the proposals.

If the ejido's obligations in the contract are not met, the payments to the ejido will not be disbursed. If the violation created damage that can be restored, the payments can begin again when the damage is restored. If the damage cannot be restored, the payments will be halted permanently. Since the contract is signed in perpetuity, compliance is required each and every year. When compliance is lacking, not only can the payments be halted, but Pronatura can also take legal action to force compliance, which could include cessation of the illegal activity and restoration. ICF maintains a legal defense fund of \$225,000 to enforce and defend the terms and conditions of the conservation easement. ICF also maintains a stewardship fund of \$250,000 that disburses \$10,000 per year to Pronatura for monitoring.

Thus far, the terms of the easement have been met by Ejido Luis Echeverria, and funds have been released to the ejido for community projects. Some of the projects that have been funded are as follows:

- 1) Technical assistance and training for a goat rancher (greenhouse for producing food for goats and cheese-making).
- 2) Technical assistance for raising chickens.
- 3) Improvements to ejido store.
- 4) Pilot project for small-scale, artisanal, high-quality salt production.
- 5) Pilot project for export cactus production.
- 6) Mangrove greenhouse for reforestation activities.

The easement payments are seen as helpful to the ejido to jumpstart new income-generating activities and to leverage additional matching funds for these projects. However, residents of the area that are not ejido members view these benefits as one more source of inequity.

Intense development pressure in Baja California means that conservation requires incentives to compete with potentially lucrative alternative land use. The Ejido Luis Echeverria conservation easement recognized these opportunity costs of forgoing development and created incentives for the ejido to protect valuable whale habitat in perpetuity. This is a model easement in terms of its design and implementation. Responsibilities of the various stakeholders and the associated procedures (e.g., monitoring, reporting, enforcement, payments) are spelled out clearly in a written contract. Long-term funding was secured up-front in trust funds (managed by a third

party) so that all easement-related costs can be covered in perpetuity. The various required activities and contingencies were all taken into account in the design. Because payments are only released when conservation objectives are met (based on monitoring compliance with the terms of the easement), incentives are performance-based, and these costs are not incurred if conservation is not achieved. Furthermore, a legal team and funds are available in case infractions must be prosecuted.

The project is still in its infancy, but given the long-term funding that was established from the start, this project is likely to be sustainable. In addition, there are legal documents that establish the rights and responsibilities of each of the actors and a legal fund to back them up. In terms of the benefits to the ejido from engaging in conservation, there may be more pressure on the arrangement in the future if land speculation raises the opportunity cost of conserving the land. The agreement does not currently include provisions to increase the annual benefits to the ejido. In addition, there are some concerns that there may be future disputes over what constitutes a “sustainable” community development project. Finally, the easement does not provide direct benefits to non-ejido members. Land disputes and tension between these residents and ejido members may threaten the success of the easement if, for example, illegal activities by non-members result in negative monitoring results that prevent payments. However, this has not occurred to date, and given the non-ejido members’ limited political and economic status it may not be in their best interest to interfere with the easement.

Finally, Pronatura has attempted to implement these methods in other Laguna San Ignacio ejidos, but encountered a number of challenges. Many areas expect larger future benefits from developing the land (because of speculation), and therefore the land is overvalued, making negotiations difficult and expensive. The legal status of some land is unclear and there are a number of absentee landlords, again complicating the negotiations. Other areas would probably require large individual payments from an easement, as funds for small-scale community development projects are unlikely to be sufficiently attractive. Conservationists are considering other approaches for these areas, since easements may be unfeasible or prohibitively costly. Several contextual factors and conditions specific to Ejido Luis Echeverria made this an appropriate approach to conservation for the area:

- An educated, entrepreneurial group of landowners who are interested in and capable of developing community projects.
- Landowners are conservation-minded and wish to stay in the area rather than sell their land and relocate (compared to many of the surrounding areas).
- There already is a viable ecotourism business (whale watching) in the area that requires habitat conservation. Therefore economic losses from the easement may not be great.

Agersted, P. R. 2006. *Evaluating Ecotourism in Mexico’s Biosphere Reserves—Whale Watching Activities in the World Heritage Site of Laguna San Ignacio, Baja California Sur, Mexico 1994-2002*. Msc Thesis, Faculty of Graduate Studies (Resource Management and Environmental Studies), University of British Columbia.

*v. Mafia Island incentive payments, Tanzania*¹¹

Mafia Island is located 10 kilometers off the mainland and 120 kilometers south of Dar es Salaam in Tanzania. It is an important turtle-nesting area, primarily for green turtles, but also for a small number of hawksbill turtles (fewer than five nests per year). Turtles lay an average of 190 nests per year on the island and surrounding small islands (densities in 2005 were approximately 50 nests per kilometer of beach). The island and surrounding waters are recognized as important sites for marine biodiversity and are included in Tanzania's first marine park, which was established in 1995 and covers 822 km².

Threats to turtles on Mafia Island include poaching of eggs and nesting females, capture in gill nets and fence traps, disturbance from seasonal fisher camps, predation by monitor lizards, and beach erosion. Prior to 2001, surveys of residents conducted by WWF-Tanzania indicate that all nests discovered by residents were poached. In 2001, the Mafia Island Turtle Conservation Program was initiated through collaboration between Mafia Island Marine Park and Mafia District Council, with financial support from WWF (Ferraro and Gjertsen 2009). The program worked with communities on Mafia Island to elect turtle Conservation Officers in 2001. This initiative led to the establishment of a Tanzanian NGO called Sea Sense, which trained the elected Conservation Officers and paid them modest allowances to patrol the main nesting beaches; relocate nests at risk from poaching, predation, or tidal inundation; and assist with data collection and tagging.

This initiative reduced poaching of nests to about 50%. Because poaching was still significant, Sea Sense in January 2002 initiated a nest incentive scheme. Under this scheme, individuals who report a nest to a monitor receive an initial payment of approximately \$3.50 once the nest is verified by the monitor. They then receive a payment of \$0.07 for each successful hatching and \$0.04 for each non-viable egg. If a nest completely fails to have a single egg hatched, or is poached or predated, no payment for hatching is made. In Tanzania, the casual laborer daily wage is about \$3. When the program was first implemented, Conservation Officers who were the first to find a nest were not paid a finder's incentive in addition to their salaries. In 2004, this rule was changed and anyone who found a nest received the same payment.

Poaching rates were 100% prior to 2001 and approximately 50% with monitors in 2001. With the implementation of the performance payment scheme, the poaching rate decreased to 3% in 2002, 2% in 2003, less than 1% in 2004, 1.2% in 2005, 4% in 2006, 6.8% in 2007 and 1.6% in 2008. In 2004, the project was extended to Temeke District, south of Dar es Salaam. In 2005, 68 green turtle nests were recorded at eight sites, a low density compared to Mafia Island. There is no baseline data that begins before the project, but Sea Sense employees believe the program has been successful, as only three nests were poached (4%) in 2005. In 2006, nest poaching remained at 4%, but it decreased to less than 1% in 2007 and 2008.

¹¹ Additional information provided by Catharine Joynson-Hicks (Sea Sense), Lindsey West (Sea Sense), Paul Ferraro (Georgia State University).

Although confounding factors prohibit precise estimation of project impacts, the evidence suggests that a large drop in poaching has been achieved by the program and that a substantial portion of this decrease stems from the introduction of the nest incentive scheme. Compared to many of the projects included in this study, the Mafia Island turtle conservation program is quite successful in its monitoring and data collection activities. The project is similar to that described in Rendova, Solomon Islands, but it includes a variable hatching payment, which creates an additional incentive to maximize hatchling production. In the case of Rendova, it would be possible for someone to harvest a portion of the eggs and still receive the hatching payment, as long as a single hatchling emerged. Also similar to the Rendova program, the Sea Sense payment initiative is quite inexpensive at a cost of about US\$10 per nest, or USD\$0.08 per hatchling.

Ferraro, P. J. and H. Gjertsen. 2009. A global review of incentive payments for sea turtle conservation. *Chelonian Conservation and Biology* 8(1): 48-56.

*vi. Maya Mountain Marine Corridor Scholarships, Belize*¹²

Established in January 2000, Port Honduras Marine Reserve (PHMR) covers approximately 160 square miles and is an integral part of the Maya Mountain Marine Corridor (MMMC) in southern Belize. The reserve is located just off the coast of Punta Gorda and extends to just north of Monkey River Village. PHMR comprises all the coastal wetlands, sea, seabed, and national lands within the area known as Port Honduras. Rapid Ecological Assessments of the MMC in the 1990s revealed that the area that is now the PHMR serves extremely important ecological functions of regional significance. The PHMR is rich in biodiversity, containing approximately 138 small mangrove cays, which provide essential habitat and nursery for juvenile aquatic species. Other critical habitats include seagrass beds, hard-bottom communities, and soft-bottom communities. A large portion of the reserve is covered by seagrass, which also provides essential habitat and food for juvenile fish species, sea turtles, saltwater crocodiles, and manatee. The reserve also contains fringing reefs and several coral patches and coral heads, which provide habitat for vertebrates and invertebrates. Twenty-two thousand people of the Toledo District, and even more people from neighboring Guatemala and Honduras, rely directly and indirectly on these natural areas for their livelihoods. Fishing and farming have been the traditional uses of the land and sea resources in the MMC. There are two villages located in the Reserve: Monkey River and Punta Negra. The residents of both villages are mostly commercial fishers, tour guides, or fly-fishing guides who depend on the Reserve for their livelihood.

Under the Fisheries Amendment Act of 1983, the Belize Fisheries Department is ultimately responsible for the establishment and implementation of marine reserves. However, the Fisheries Department entered into a formal agreement for co-management of the PHMR with the Toledo Institute for Development and Environment (TIDE). Management arrangements made with the Department of Fisheries stipulate that TIDE is responsible for (1) the day-to-day management of the PHMR, (2) the proper implementation of all aspects of recreation, (3) providing fisheries with annual financial statements and reports, and (4) collecting user fees.

After a baseline assessment in 2001, a management plan was developed in 2002. Since that time TIDE has worked closely with partner organizations and community members to prevent illegal activity in the Reserve and promote sustainable alternative livelihoods for displaced fishermen. The historic use of PHMR has been fishing, including fishing by foreign nationals from neighboring Honduras and Guatemala. Many of the Belizean fishers in the area complain of illegal fishing activities by foreign nationals, and they attribute the reduction in certain fish stocks to such activities. Based on recommendations of a PHMR Management Effectiveness study that was completed in 2006, TIDE has been bolstering its scientific research program and diversifying alternative livelihoods options to improve PHMR management.

A Head Ranger and other TIDE rangers are posted at the PHMR ranger station and rotated on a bi-monthly basis. The rangers patrol the reserve to reduce threats such as gill

¹² Additional information provided by Celia Mahung (TIDE).

net use, illegal fishing, over fishing, and under-size catch. These patrols also help to monitor activities within the conservation no-take zone and the preservation zone. In addition, the rangers support TIDE's public relations by conducting community meetings and play an active role in research activities conducted within the Reserve. TIDE supplements this enforcement presence with a community ranger program, in which local fishermen and tour guides are trained to assist staff rangers through an integrated communications system.

A majority of community ranger phone or radio calls to TIDE to report illegal activity in 2007 resulted in an arrest or confiscation of illegal equipment. In cases of arrest, TIDE rangers transfer detainees to the Fisheries Department, which then carries out the prosecution. TIDE rangers conduct joint patrols with the Belize Defense Force and the Police Department, and they have the legal authority to confiscate equipment and vessels. The Fisheries Department decides what happens to the confiscated items in the course of prosecution.

Recently, TIDE has made significant investments in patrols and surveillance. Over the years, there has been an increase in the number of patrol boats and in the fleet of vessels. In 2007, 750 patrols were conducted in the PHMR. Surveillance goals include:

- Minimizing illegal fishing, hunting, and logging pressure.
- Educating local residents about conservation goals and rules and regulations of the area.
- Monitoring of flora and fauna to determine the impacts of management.

In 2007, 34 gill nets and 5 long lines were confiscated, 2 arrests made, and 8 warnings given. More than 60 joint patrols were carried out in the Marine Reserve, and approximately 20 percent of them resulted in arrests for illegal activity or confiscations of illegal gear. In recent years, the people who were arrested or warned, or who had equipment confiscated, included both locals and foreigners. Although most were foreigners, some of the locals actually were involved in the TIDE training programs. The arrests did lead to successful prosecutions, and penalties included fines and confiscation of equipment.

TIDE provides incentives for conservation that range from alternative livelihoods to scholarships to sporting events such as the Freshwater Cup Environmental Football League. Before the introduction of TIDE, conservation efforts in the southern region of Belize were limited. Most data collection was done through the Ministry of Fisheries and Agriculture. The government was also the main entity responsible for monitoring all the resources in southern Belize. The scholarship program encourages fishers to give up gill nets and other unsustainable management practices in return for scholarships. The program addresses the economic hardships of giving up unsustainable fishing methods by providing another way for parents to finance their children's education. Over 50 students have received scholarship support from the organization. Scholarship recipients come from across the Toledo District, although not always from PHMR buffer communities. Generally, the scholarships cover tuition and books for high school

students. The costs of the scholarship program are approximately BZ\$10,000 per child per school year on average.

The scholarship program (MMMCSP) targets children whose parents agree to stop using unsustainable fishing and farming methods. The recipients of the scholarship program are expected to contribute to conservation efforts in the district and work alongside TIDE on community outreach activities. The scholarship program also encourages parents of the children to be engaged in a conservation effort. Recipients of a special scholarship program are required to, in addition to attending tutoring sessions and preparing progress reports for CAFA, choose a volunteer project that will allow them to share their knowledge with their community and to keep notes of ideas on a viable business venture for the future.

Although scholarships are provided as benefits in exchange for commitments to forgoing unsustainable fishing practices, the benefits of the program are not directly contingent on performance, and there is no formal agreement about the benefits. Performance of children's progress in school is well monitored and can affect their participation in the scholarship program, but it does not appear that conservation performance is measured or that it truly affects which families receive scholarships and whether the children retain them. There is no explicit quid pro quo or formalized sanction system, but the project staff states that as a last resort it can revoke a scholarship if the family is caught poaching.

Although project implementers believe the program is successful, monitoring data cannot substantiate this conclusion. Biological data indicates a decline in abundance of reef fish, queen conch, and spiny lobster, despite the protection offered by the no-take zones. Surprisingly, the data indicate that the conditions in the no-take zones have been getting worse than the conditions in the general use zones. It is unclear at this point whether it is because of incomplete data collection, exogenous factors, or some failure of the PHMR. Foster (2008) states that large inconsistencies and missing data makes detailed analysis impossible at this time. Despite the inability to measure biological impacts of the project, the students who have graduated from the program over the years represent what may be a new generation of conservation leaders in Toledo. The program is ongoing and will continue to provide financial assistance for scholarships as long as funding permits.

Foster, N. L. 2008. *PHMR: Status of the Park Report*.

*vii. Misool Eco Resort lease, Indonesia*¹³

Raja Ampat is a large archipelago of nearly 50,000 km² in eastern Indonesia's Papua province, with a population of 32,000 spread over 92 villages and sub-villages. Raja Ampat is considered an epicenter of marine biodiversity. In 2002, The Nature Conservancy conducted a rapid ecological assessment of Raja Ampat, finding more than 540 species of coral (75% of world's total), over 1,000 species of coral reef fish, and 700 species of mollusks. The area also provides habitat for a number of endangered species such as sea turtles.

Despite the beauty of the Raja Ampat islands, there is currently little tourism in the area. A group of British, German, and American divers decided to build an ecotourism resort in southeast Raja Ampat on the previously uninhabited Batbitim island. The location is 240 kilometers from the nearest competing resort and a one-hour speedboat journey from the nearest village. On November 28, 2005, the Misool Eco Resort entered into a 25-year lease agreement with a local community—the customary owners of the island—to establish the 425-km² Misool Eco Resort No-Take Zone (MER NTZ) surrounding Batbitim and many neighboring islands.

The signatories to the lease contract were the Misool Eco Resort company and the managing director, Andy Miners, and the heads of the Bahale and Yelfom families in the Yellu village. Under the terms of the lease, MER secured exclusive rights to Batbitim and Jef Galyu Islands, including hills, forests, coconut trees, water, animals, and the surrounding lagoon. In addition, rights were secured to designate approximately 425 km² of surrounding seas as a no-take zone (NTZ), including animals, coral reefs, turtles, sharks, rays, and fish. The agreement was made under both Papuan adat (customary) law and Indonesian law.

The Misool Eco Resort lease is a form of conservation agreement, as the resort entered into a contract with 18 people in Yellu, the village of landowners, 14 miles to the northwest of the resort. Under the lease, anyone other than MER is prohibited from taking any marine products from the NTZ or granting permission to any other party to do the same. The community agreed to the no-take zone and a sasi opening (traditional system of time-area closures) every two years for two types of shellfish. In return for rights to the islands and marine area, MER agrees to act as a steward of the area and pays a lease fee to the community every five years, as well as providing the community with other benefits. In addition to the land rental payments to two heads of families at the start of each five-year term, the resort also employs Yellu villagers and provides them with health insurance for themselves and their families, job training, and English lessons. Under the agreement, the resort regularly patrols the area for illegal fishing and shark finning, and manages the area for conservation, including observance of the no-take area.

The Misool Eco Resort opened its doors to visitors in October 2008. The managers believe the strengths of the project are its location, the relationships they have built with

¹³ Additional information provided by Andrew Miners (Misool EcoResort), Shawn Heinrichs (Blue Sphere Media), Mark Pearce (Misool EcoResort).

villagers, and the eco-conscious vision from which they did not stray. They also believe it was wise to establish the no-take zone before building, and to have adhered to the no-take zone even though the agreement does not require them to do so (Heinrichs 2008).

Despite the parties' experience and understanding of the area, establishing the agreement for the Misool Eco Resort lease faced many challenges, taking approximately one year from conception to completion. There were many legal issues to surmount, including identification of the appropriate landowners, obtaining government permission, and preparing the appropriate documentation and fees. Discussions with other companies in the area have revealed similar experiences, indicating that continually changing requirements and regulations are to be expected. Agreements, therefore, require continuous discussions and adaptation. Since long-term planning is not common in the area, agreements must be negotiated and managed as an ongoing adaptive process, allowing the arrangements to evolve over time.

The MER experience generated several lessons. The MER developers now believe they should have hired a community-relations officer from the village at the start of the project to serve as a liaison and to facilitate the engagement process (Heinrichs 2008). Finding a community champion who understands and supports the project and can communicate these ideas to their community is extremely valuable. MER also realizes that they could have done more to socialize the concept in the various communities around the resort. For example, some of the young Yellu people believed that their elders might have sold off their heritage by agreeing to the resort and no-take zone. However, when MER heard about their concerns and invited them to the resort, they were able to demonstrate the positive impacts of the project. It is very important to ensure that key members of the community are able to observe for themselves what is happening, in order to avoid misinformed gossip and speculation. Dissemination of information through word of mouth from trusted peers is critical in areas like Raja Ampat. However, the engagement process is never complete. As a comparison, the Atlas pearl farm company, which also has been operating in the area for many years, estimates that 30 percent of their senior management effort involves continuing community-relations activities. The company believes this effort to be the most important condition for success. Maximizing employment opportunities for as many people as possible as soon as possible also is critical for ensuring project support. With respect to the negotiations, the resort owners believe that employment and training opportunities were more important than the cash payments in convincing the community to agree to the contract.

MER intends to apply these lessons in an effort to establish a no-take zone at another site. There is an area that is being used by turtle harvesters and shark finners, in return for which the community receives a fishing fee of \$425 per year. MER plans to work with the community to investigate the possibility of declaring a no-take zone in return for comparable benefits.

The example of Misool Eco Resort illustrates how a conservation agreement can be negotiated and structured in an area with complex property rights and cultural context. Since the financial stakes are high in the case of a private business, one should expect

them to adopt the highest standards of due diligence to ensure that the project is successful. As one of the project staff stated, the success and future of the MER is intimately intertwined with the future wellbeing of the marine ecosystem and the community.

Heinrichs, S. 2008. Conserving in Papua, Indonesia, through Ecotourism. Presented at *A Private Sector Approach: Conservation Agreements in Support of Marine Protection*, June 16–19, 2008, Bainbridge, WA.

viii. Navini Island Resort lease, Fiji

Navini is one of 32 small islands in Fiji's Mamanuca group, one of Fiji's major tourism assets featuring island resorts, white sandy beaches, sunshine, calm seas, and gentle tropical breezes. This region has been the focus of tourism development from the mid-1960s, and Navini hosts one of the smallest tourism establishments, the Navini Island Resort, established in 1976.

Historically, Navini Island's coral reefs suffered various threats including overfishing, destructive fishing through the use of explosives and poison, and pollution (mostly from wastes from the resort). Although the majority of households in nearby communities now depend heavily on the tourism industry for their livelihoods, this initially was not the case, as locals lacked qualifications for tourism industry jobs. Therefore, local communities depended heavily on marine resources for income and protein. Uncontrolled fishing in terms of methods and techniques, absence of catch quotas or restricted areas, and fishing without licenses or permits by locals as well as outsiders led to decreases in fish stocks and degradation of the ecosystem. Pressure was due mainly to limited livelihood options in the area and increasing cash needs for expenses such as school fees.

The Navini island marine managed area (MMA) is a partnership and collaborative conservation effort by the Navini Island Resort and the chiefly clan of the Tui Lawa, the paramount chief of the Malolo region. Situated in Fiji's busiest tourism area and close to several fisheries landing sites such as Nadi Town and Lautoka city, the resort management team is keenly aware of the value of the reef system surrounding the island and the need for conservation to sustain tourism development. In 1988, the resort management team approached the Tui Lawa and members of his clan to ask for protection of the reefs surrounding the island. The team from Navini explained the rationale for establishing the MMA and also discussed the commercial use and value of fish being taken from the area. The resort then offered payment in excess of that value as compensation for establishing the protected area, which resulted in the agreement to establish what is now Fiji's oldest MMA.

The Navini Island MMA is an agreement between the Tui Lawa and his clan and the Navini Resort; however, it is not formally recognized under Fijian government legislation or policies. The reefs surrounding the island resort form the MMA and are fully protected under a complete ban on extraction of any marine resources. Some village members who do not belong to the land-owning clan initially opposed the creation of the MMA, but they were convinced through the intervention of the Tui Lawa and assistance from the Nadroga Provincial Council Office. In this conflict resolution meeting, the Tui Lawa highlighted the reasons for protecting the reefs, and the Provincial Office stressed to the other community members the need to respect chiefly decisions.

The agreement is renewable every 12 months. Each year, the management of the resort holds a meeting with the Tui Lawa and decides on the renewal and the terms of agreement for the following year. The resort pays F\$5000 annually for the renewal of the agreement. These funds are managed by the Tui Lawa and are used for education and development needs of clan members. The resort provides additional benefits to the Tui

Lawa's clan and the community of Malolo Island as a whole, such as purchasing library books and other school materials for the local primary school. The resort also supports community development projects with resources, cash, and labor. The total value of these benefits exceeds F\$10,000 per year. Finally, local communities are also observing ecosystem benefits. In one district meeting in 2009, the Tui Lawa emphasized that fishing grounds throughout the Malolo region are benefiting from the Navini MMA, as stock recovery in the Navini reef is having positive spillover effects.

Since the MMA is close to the island resort, surveillance and monitoring of illegal activities falls under the daily duties of Navini resort staff. There is no formal surveillance work plan, but staff members feel obliged to carry out this task because they are aware of the importance of the MMA to natural biodiversity and long-term sustainability of their business. When poachers are detected, a staff member requests that they leave, as the area is a no-fishing zone. Once the poachers depart, the staff informs the Tui Lawa, who through his traditional links requests that chiefs of the area where the poachers are from instruct their people to refrain from such activities. Between 1989 and 1992, after the establishment of the MMA and recovery of marine resources, some poaching took place by village fishermen. The Tui Lawa was alerted to this problem, and poaching diminished soon thereafter. Poaching incidents are now rare and involve boats from other areas such as Yasawa or Lautoka rather than locals.

The Navini MMA is based on a negotiated agreement between the resort owner and the owner of the island—the Tui Lawa and his clan—and therefore the context differs from other MMAs in Fiji that involve conservation organizations. For instance, the Navini MMA lacks a formal management plan, monitoring plan, and other project components known to the conservation community. Nevertheless, the negotiated arrangement between the stakeholders effectively supports the sustainability of the reefs surrounding Navini island.

The Navini Island Resort management team is committed to the continuation of the MMA program, as it is important to the tourism enterprise. However, one concern is the lack of capacity-building programs that could enable the community to self-operate the MMA if the resort closes or if a new owner does not share the same priorities as current resort management. Establishing links between the Navini MMA and programs of conservation organizations such as the Fiji Locally Managed Marine Areas network could provide an additional safeguard for long-term sustainability. The main strength of the Navini MMA is the dedication shown by the resort in providing compensation to the community, and the community's commitment to the program for the past 22 years, especially the active participation of the Tui Lawa and members of the chiefly land-owning clan. The Navini MMA case study shows how marine conservation in Fiji can be effectively implemented by stakeholders other than the government and conservation institutions.

*ix. Olive health clinic, Solomon Islands*¹⁴

Olive is a village located on the New Georgia mainland in the Roviana Lagoon, in the Western Solomon Islands. The marine area around Olive contains inner-lagoon habitats including grass beds, sand banks, mangroves, shallow reefs, and pools. The area is important for green (*Chelonia mydas*) and hawksbill (*Eretmochelys imbricate*) turtles, dugong (*Dugong dugon*), and saltwater crocodile (*Crocodylus porosus*). It is a spawning aggregation area for various triggerfish, snappers, and emperor fish (Aswani 2004).

In 2003, Olive established a permanent closed-area MPA to protect the coral reefs and reef fish in one of the inner lagoons. Covering 157 acres, the MPA is part of a system of closures developed in collaboration with the Western Solomons Conservation Program, which presents conservation, development, and education as a three-pronged approach to improving wellbeing. Community development is a major component of the program, which has assisted with various development enterprises (e.g., clinics, health posts, schools, school renovations, community halls, women's halls), and grants and capacity building for local students (Aswani 2004). The program believes it is beneficial to provide some communities with initial assistance with infrastructure, since government and non-government organizations in the region have failed to do so (Aswani 2004). The chosen development intervention in Olive was a health clinic, which was completed in 2008. The program moved away from implementing alternative livelihood schemes after its initial failed attempt in Baraulu, also described in this study.

The benefits from the clinic are available to all people in Olive. Rather than providing cash to individuals, the program only funds benefits that will accrue to the entire community or some large portion of it (e.g., women or children). There are no specific requirements for a village to receive benefits, other than establishing a MPA and providing the timber and labor for construction. The benefits of the program are not contingent on performance, and there is no formal agreement about the benefits. The only performance that does affect the provision of benefits is whether the community provides adequate timber and labor for the development project. There is no explicit quid pro quo or formalized sanction system. However, in some areas, when the community has not performed, the project staff may threaten to take away certain benefits. For example, there are reports of one of the project staff stating that poachers will be banned from the clinic.

Biological monitoring has indicated that the project appears to be achieving its goal of protecting specific marine resources valuable for nutritional consumption and income (Aswani et al. 2007, Aswani and Sabetian 2010). Although there have been poaching incidents and there is still not 100 percent compliance, the results are most likely better than if the closures had not been established. Additional anecdotal evidence indicates that the completion of the clinic has resulted in less poaching. However, both enforcement protocols and monitoring of biological and compliance outcomes are minimal, and the program could better reassure donors and skeptics of its performance by providing more

¹⁴ Additional information provided by Shankar Aswani (University of California, Santa Barbara).

concrete evidence of its success. Recently, the program has conducted several workshops to train rangers in each village to conduct a modified version of Reef Check monitoring in their village MPAs.

The health clinic built in Olive is an example of benefits in the form of infrastructure that have accompanied many of the MPAs established since the first in Baraulu. According to Aswani (2004), the infrastructure projects provide a tangible result that helps to secure buy-in for conservation. Not all villages in the program receive infrastructure projects, and the program attempts to strategically position the development initiatives in areas that can be accessed by a number of villages. The program requires communities to supply labor and some resources to avoid the impression that MPAs are a trade-off for the development projects.

Two strengths of this program are the alliance with the Christian Fellowship Church (CFC, one of the most respected and strongest authorities in the area) and a deep understanding of local politics and culture. The program coordinator has worked with the community for more than fifteen years and thus understands the community's social norms, customs, ways of living, resource concerns, and needs. Furthermore, the long-term presence fosters trust and allows a long-term perspective that acknowledges that there may be problems some years, but they can be overcome by continuing the relationship.

In the coming years, the program will continue to expand throughout Marovo and Roviana and Vonavona Lagoons. In Vonavona, villages began implementing MPAs in 2002, and there are now more than eight. Marovo has three MPAs, Rendova has one, and there are MPAs under development in Vella La Vella and Kolombangara. The program will continue to develop integrated resource management projects with infrastructure development programs. An important question that remains in the minds of program staff is how long the benefits will be required to motivate people to establish and maintain MPAs. There is some hope that the MPAs will lead to improvements in fisheries, thereby reducing the need for additional benefits. However, the degree to which these spillover benefits will occur and the degree to which this improves human wellbeing remains to be seen. Another alternative is to accept that the conservation program in such an area requires ongoing incentives in the form of benefits and to structure a formal agreement as in the other cases in this study.

The program coordinator is interested in the possibility of developing formal incentive agreements, but some issues arise. The current program is quite large in area and since people in one village often have claims to marine areas in other villages, it may be necessary for all villages to receive benefits. Also, the program has developed a loose agreement that is flexible in terms of dealing with conflicts. A formal agreement would need to also acknowledge the cultural norm of long-term relationships that forgive transgressions. Finally, since poaching is often a result of personal disputes, imposing sanctions or withholding benefits may perpetuate the conflict in this context.

Aswani, S. 2004. *The Roviana and Vonavona Lagoons Marine Resource Management Program Final Report (Phases 1 and 2) 2000-2004*. Department of Anthropology, University of California, Santa Barbara.

Aswani, S., S. Albert, A. Sabetian, and T. Furusawa. 2007. Customary management as preventive and adaptive management for protecting coral reefs in Oceania. *Coral Reefs* 26 (4): 1009-1021.

Aswani, S. and A. Sabetian. 2010. Implications of urbanization for artisanal parrotfish fisheries in the Western Solomon Islands. *Conservation Biology* 24(2): 520-530.

*x. Tetepare and Rendova incentive payments and scholarships, Solomon Islands*¹⁵

Tetepare Island is located in Western Province of the Solomon Islands and is approximately 11,880 hectares in size, with the highest point at approximately 350 meters (Maruia Society 1991). The island retains roughly 97 percent of its original forest growth, except for a small area in the western end that was cleared to accommodate a modest 735-hectare coconut plantation. The landowners—collectively the Tetepare Descendants' Association (TDA)—live throughout the Solomon Islands, but the majority live in four villages on Rendova, the largest (approximately 40,000 hectares) and closest island west of Tetepare.

In March 2002, Australian biologists who had been working with the Tetepare descendants since 1999 proposed the idea of establishing a conservation agreement for protecting leatherback turtles. Together with the TDA project officer from the village of Baniata, they initiated a series of awareness and community consultation sessions that culminated in the inception of the incentive-based monitoring program at Baniata in September 2002. This project extended to the villages of Havila and Retavo in the following year. Each participating village selected its own turtle monitor. The monitors are not paid a salary, but they are responsible for recording data about turtle nesting activities and receive financial incentives each time they do so. In addition to financial incentives linked to turtle monitoring, the project also provides incentives in the form of a scholarship program and conservation- and tourism-based employment.

In 2004, the turtle incentive program operated as follows: a villager who sees a leatherback coming onto the beach to nest is to bring the turtle monitor to the turtle. If the monitor tags the turtle and records the information on the data sheet, the observer is paid 15 Solomon Islands Dollars (SBD) and the monitor is paid 10 SBD (in 2005 dollars, 15 SBD is equivalent to approximately 2 USD). If the observer disturbs the turtle in any way, he does not receive the payment. In addition to recording the data, the monitor photographs the turtle, recording the date and time for verification purposes.

In addition to the individual payments, 10 SBD is placed in a community fund, managed by a Board of community members. There are five signatories to the fund, all of whom must sign to withdraw money. When funds are withdrawn, the signatories are required to provide minutes of the community meeting clarifying how the money will be used. The community fund has only recently been opened, and the community has indicated that they are saving up to build a new community hall and/or school classroom.

A villager who finds a nest or tracks after the turtle has gone back to sea must bring the turtle monitor to the nest. If the turtle monitor marks the nest and records the other information on the data sheet, the person who found the nest or crawl is paid 10 SBD, the monitor 10 SBD, and the community fund 10 SBD. If the nest successfully hatches (i.e.,

¹⁵ Additional information provided by Allan Tippet Bero (Tetepare Descendants' Association), Keyvan Izadi (Solomon Islands Community Conservation Partnership), Aaron Bruner (Conservation International), Anthony Plummer (Australian Volunteers International).

at least one hatchling emerges), the initial reporter is paid 30 SBD, the monitor receives 10 SBD, and an additional 30 SBD is paid into the community fund.

A TDA staff member makes six visits to the villages per season and collects the photos and data sheets and distributes the payments. According to the local project coordinator, there is great competition to find and report the turtles and nests. This project creates multiple incentives for turtle conservation. Every villager and turtle monitor has the potential to access payments for reporting and not disturbing or consuming turtles or their eggs. In addition, there is an incentive to prevent others from disturbing the turtle or the nest, since they receive an additional payment if the nest hatches. Finally, the community as a whole faces an incentive in the form of contributions to the fund if turtles or their nests remain undisturbed. Thus, someone who did not find the nest receives some benefit (via the community fund) from not harvesting. This, of course, depends on the degree to which everyone perceives the fund as something from which they will benefit.

Since the 2007 tsunami, tides have been quite high, inundating many of the nests. Therefore, all nests below the high water line are now relocated, and the community rangers monitor the nests. The finders still get a payment, but there are no individual hatching payments. Instead, the hatching payments all accrue to the community fund. The resource owners have recently requested an increase in the level of payments because of inflation.

In 2005, TDA began awarding a limited number of educational scholarships to eligible members each year as a reward for conserving Tetepare Island. Any TDA member can apply for a one-year scholarship, and scholarships are awarded based on academic merit and greatest need. If a student performs well, they may receive an additional year of support. Scholarships are awarded to high school students and for vocational training in trades such as teaching and nursing. All funds are externally audited and paid directly to the schools to ensure transparency, but there is no direct link to conservation performance in terms of the awarding or maintenance of scholarship funds.

The program began in 2005 with 14 scholarships and in 2008 supported 84 secondary students and 5 tertiary students:

2005: 14 secondary, 0 vocational (value of approximately \$2,100)
2006: 56 secondary, 0 vocational (value of approximately \$8,400)
2007: 56 secondary, 0 vocational (value of approximately \$8,400)
2008: 84 secondary, 5 vocational (value of approximately \$14,850)

Employment incentives are centered on areas near Tetepare. TDA operates a tourism project in Tetepare that includes village stays in Baniata, for which visitors pay villagers for food and lodging. In 2003, there were approximately 40 visitors to Tetepare, of whom 20 also visited Baniata, and visitor numbers have been growing ever since. All costs of the eco-lodge are covered through guest payments, and remaining profits are used to supplement other aspects of the conservation program. Occasionally, the funds are used for fuel purchases or to build community infrastructure.

There is an employment rotation scheme for people trained as cooks, tour guides, and boat drivers from the four villages in Rendova. The marine monitors are on a weekly rotation, but the same monitors are used throughout the year. There are more people in the villages that desire employment than the project can employ, but TDA strives to employ additional members, such as in construction projects. In coming years, TDA anticipates greater focus on sustainable livelihoods. For instance, they have contemplated purchase of roasted ngali nuts from the villages for sale to a retailer in the Solomon Islands capital, Honiara.

Through these programs, the Tetepare Descendants' Association has incorporated economic incentives into their conservation program for several years. The leatherback payments involve multiple levels of incentives by financially rewarding individuals as well as the community as a whole.

The conservation agreement currently being implemented on Rendova has been successful in protecting nesting leatherback females and their eggs. While there are occasional poaching incidents, previous to the project nearly all eggs and females were harvested. In addition, the project has provided modest income to villagers and funds for community development. The scholarship program could be strengthened as an incentive by creating a stronger link between conservation performance and the provision of scholarships. Financially, the project has long depended on short-term funding that does not quite cover the full range of needed activities, posing an obstacle to long-term planning. Current efforts to secure long-term funding in the form of an endowment are showing some promise. This program suggests that conservation agreements are a viable option in Melanesia, provided that the land tenure situation, mechanisms for equitably disbursing incentives, and monitoring systems are clearly articulated and transparent.

Gjertsen, H. and T. Stevenson. 2010. Direct Incentive Approaches for Leatherback Turtle Conservation. In: *Conservation of Pacific Sea Turtles*. Dutton, P. H., D. Squires, and M. Ahmed (Eds.). University of Hawaii Press.

Ferraro, P. J. and H. Gjertsen. 2009. A global review of incentive payments for sea turtle conservation. *Chelonian Conservation and Biology* 8(1): 48-56.

Lees, A., Garnett, M. & Wright, S. 1991. *A Representative Protected Forests System for the Solomon Islands*. Report prepared for the Australian National Parks and Wildlife Service. Maruia Society, Nelson, New Zealand.

ALTERNATIVE LIVELIHOODS

i. Ayau piggery, Indonesia¹⁶

Raja Ampat is a large archipelago in eastern Indonesia's West Papua province, covering nearly 50,000 km², with a population of 32,000 spread over 103 villages and sub-villages. The Ayau and Asia group of atolls and islands are located in North Raja Ampat. Of the 24 islands, only four are inhabited with a total of five villages. The five villages are Yenkawir and Dorekhar on one island and Meosbekwan, Rutum, and Reni on three other islands. The islands have very limited agricultural potential as they are either low sandy cays with little vegetation or raised coral reefs with limestone rock supporting scrub vegetation and a few trees.

Rapid ecological assessments by Conservation International (CI) in 2001 and The Nature Conservancy in 2002 led these organizations to declare Raja Ampat as the "epicenter of marine biodiversity." Raja Ampat is home to over 540 species of coral (70 percent of the world's total), over 1,300 species of coral reef fish, and more than 600 species of mollusks. It also provides habitat for a number of endangered species, including dugongs, whales, and four species of sea turtle.

Turtles and turtle eggs have been a staple food in the Ayau Islands for many years. All sizes of green turtle are hunted, and eggs are also taken on a regular basis. Turtle meat is particularly sought after to provide a communal protein source at large community gatherings, including religious holidays, weddings and funerals. It is estimated that at least 80 turtles have traditionally been taken for annual Christmas feasts in Ayau; at other feasts or church events, 30 to 50 turtles may regularly be consumed.

In 2005, CI visited the Ayau villages to conduct outreach and learn about their resource use. The local CI representative held village meetings to urge residents to stop eating turtles. In 2005, the village headman of Yenkawir suggested that a substitute for turtle meat would help the communities to agree to stop the hunt. He emphasized, however, that culturally it would be important that the substitute also represent a large communal protein source, as opposed to, for instance, individual plate-sized fish. In 2007, Yenkawir committed to become an example of zero turtle take beginning Christmas of 2007. They wrote a letter to CI to announce this and to request assistance in developing alternative protein sources and alternative livelihoods, noting that a lack of response may force them to continue hunting turtles. CI agreed to supply six large pigs for the Christmas feast in Yenkawir to demonstrate that it is possible to have a feast without turtle meat. CI also supplied each family group (Marga) with two piglets to raise for later feasts as an alternative to sea turtle meat. The other villages have not yet agreed to halt turtle consumption.

Although Ayau villagers have traditionally kept some pigs (housed in wooden pens located at the high tide area), these husbandry efforts have been viewed as only

¹⁶ Additional information provided by Helen Newman (Consultant), Ketut Putra (Conservation International), Mark Erdmann (Conservation International), Jacinta Djuang (Conservation International).

marginally successful in that the pigs lack proper nutrition and are generally unhealthy, and the conditions created are unsanitary. In order to improve the chances of successful pig husbandry as a sustainable alternative to turtle capture, CI committed to support an intensive technical assistance program through the agricultural extension services of Udayana University in Bali. A professor from Udayana visited Ayau for an initial assessment of the availability of locally available food sources for pig husbandry and the feasibility of developing a closed-system piggery to prevent water contamination from pig waste.

With Udayana's guidance, CI then helped Yenkawir build and manage a closed-system piggery in the village, whereby all waste is collected and processed into cooking biogas and semi-processed compost manure. The biogas is used for cooking with an adapted cooker, and the manure can be used as compost for fruit and vegetable production, which currently is very limited due to poor soil quality. Yenkawir was rewarded with this pilot project because of their commitment to turtle conservation and their demonstrated success with pig rearing. Four people were taken to Bali for training, but only two have continued with the piggery work. CI also supplied each village with simple machines that extract coconut oil and produce residue for pig feed.

The pigs were initially provided to villages as a one-time benefit. However, for the time being, CI has decided to continue providing pigs each year to the village hosting the Christmas feast. There is also discussion about whether villagers should breed the pigs to provide an ongoing supply for the future and eliminate the need for annual subsidies. If the pilot succeeds, the plan is to expand to four other villages as an incentive for setting aside no-take zones within their reef areas. Discussions between CI and the headman in each village revealed an interest in developing a pilot piggery project for each Marga. Two villages also promoted the idea of a chicken farm as another alternative to regular turtle consumption.

In addition to supplying pigs as substitutes, CI is pursuing alternative income strategies to discourage people from harvesting turtles. CI has already supplied Ayau with a coconut press to make oil for pig feed. Villagers have also received training for virgin coconut oil production. A nearby pearl company runs a boat to Bali, which may provide a low-cost means of transporting oil to markets. Some of the concerns with the feasibility of this enterprise are ensuring the quality and consistent production of the product, the reliability of transportation and markets, the profitability of the product, the capacity and skills of the villagers, and whether the villagers are interested in the enterprise. Villagers were also trained in salt production, but similar concerns arise. Overall, villagers are open to all these new livelihood options, but the ideas are non-local, may not fit with cultural practices, and may require a level of skills and capacity and other conditions that are not present.

Although there currently is no monitoring of turtle harvest and consumption, based on reports from local monitors it appears that Yenkawir villagers have taken few turtles. The project achieved a reduction in turtle harvest of 80 to 100 turtles that normally would be consumed for the Christmas feast. In addition, the villagers were exposed to the

possibility of a feast without turtle meat. The request for pigs as an alternative to turtles came from within the community, rather than from the conservation organization, and thus it is more likely to be viewed favorably. The project has also been very proactive about using local assistants and building their capacity, rather than relying on CI's Indonesian and foreign staff.

The economic benefits from the program are employment of some villagers (six patrollers per village plus two MPA directors), the pigs that the villages have received, the biogas system, and training in production of salt, virgin coconut oil, and soap. There currently are no formal rules regarding the conservation commitment or monitoring program, or sanctions if someone breaks the rules. Thus, the benefits are not contingent on performance. However, in a proposal for expanding the pig project, it appears that there is some interest in formalizing the agreement and making the benefits more performance based.

*ii. Bar Reef Sustainable Livelihoods Enhancement and Diversification (SLED), Sri Lanka*¹⁷

Kudawa village is situated on the northwest coast of Sri Lanka. The community depends on fishing in the Bar Reef area, where over 200 species of fish and 120 coral species have been recorded. Although the Department of Wildlife Conservation (DWLC) declared 306.7 km² of Bar Reef as a marine sanctuary in 1992, these species are threatened by destructive fishing methods and overfishing. Boundaries of the sanctuary are based purely on biophysical characteristics. Little or no stakeholder consultation was carried out when DWLM defined the boundaries. All resource extraction is prohibited in the sanctuary, but no formal protection system exists and poaching is a regular occurrence.

Subsistence fishing using traditional gear in near-shore areas changed in the 1970s, when the Fisheries Department introduced monofilament nets, and fishing effort shifted to Bar Reef. Introduction of lobster nets by a private company in 1973 accelerated fishing activities, and the Bar Reef system began to degrade. Collection of sea cucumbers and ornamental fish began in 2000, posing an additional threat. Purse seine nets are the most destructive fishing gears being used, and there are reports of these gears being used with dynamite. Other nets (monofilament, bottom set, nets for ornamental fish collection) also cause damage. These destructive practices have divided the community; fish traders support net fishing operations, but traditional subsistence fishers oppose these practices.

Fishers stated during interviews that they aspire to improve education for their children, build financial capital, and start fish trading (Banda et al. 2007). Divers collect sea cucumber, lobsters, and ornamental fish with scuba equipment. According to interviews, they aspire to process and export to other countries to increase profits (Banda et al. 2007). There are several cooperatives and associations in the village. The two fisheries cooperatives represent the majority of people engaged in lagoon and coastal fisheries.

Integrated Marine Management Ltd. (IMM) developed the Sustainable Livelihoods Enhancement and Diversification (SLED) approach (IMM 2008). Community Help Foundation (CHF) initiated the SLED process at Kudawa in March 2007, working with experts in sociology, resource management, and agriculture to build partnerships with stakeholders and to better understand existing livelihoods. Following this discovery phase, the direction phase began in August 2007, focusing on analyzing factors that help or inhibit change, establishing a mechanism for joint learning and feedback between the field team and the community, vision-building, and exploring opportunities for developing livelihood options.

The SLED process emphasizes these early phases in building long-term success of interventions. The strength of the efforts relate to the time the field team has taken to build relationships with the community and letting the community lead the process. The rationale is that the changes in resource use that are being promoted are far more likely to

¹⁷ Additional information provided by Ben Cattermoul (Integrated Marine Management Ltd.), Hashantha Nusry (Marine and Coastal Resource Conservation Foundation), Indra Ranasinghe (Marine and Coastal Resource Conservation Foundation).

be sustained when they are based on changes in attitude and confidence. The expectation is that even if some of the specific diversification activities do not succeed, people will have the confidence to try again.

The field team began supporting pilot livelihoods programs in January 2008, including:

1. Seaweed farming: With the agreement of the community members, two beneficiaries who had the requisite diving and swimming skills were selected for the pilot phase of seaweed farming. Market analysis suggested that demand exists for seaweed collected from the lagoon. To establish a good production and marketing process, the beneficiaries were shown samples of natural seaweed packets available in the market and discussions were held with potential buyers. Selling the product requires processing large amounts for export, thus the product has not yet been sold.

2. Sea bass culture: Based on positive results elsewhere, sea bass culture was selected as a pilot for Kudawa, building on existing skills and community preferences to use their own resources. Preliminary discussions were held with a fingerling importer who visited the site to select suitable locations. The importer agreed to provide fingerlings on the basis of a buy-back system. Materials for four cages were purchased, and two beneficiaries assisted with the construction and placement. The first batch of 400 fingerlings was provided, and continuous monitoring carried out by the field team with assistance from a fisheries specialist. Half of the stock has been sold in the local market.

3. Home garden improvement: After field investigations and focus group discussions with women, it was proposed to improve home gardens with the objective of reducing household expenditures on vegetables and fruits. The suitability of the proposed intervention was investigated through consultations with an agricultural specialist. Suitable vegetables and other species were identified for garden improvements. Tentative cost estimates and a water-usage plan were prepared, and discussions were held with an organic fertilizer producer. Five women from the Kudawa village were selected for the pilot. After site preparation and fencing, plants and seeds were distributed among the beneficiaries, and necessary guidance was provided. To manage the water system, materials and services were purchased from City Garden Co. Ltd. A drip system was established in each home garden. According to community surveys, the home garden improvement program has brought positive results and increased the confidence of beneficiaries.

4. PADI licensing: During discussions with individuals engaged in sea cucumber and ornamental fish collection, it was suggested that facilitating PADI licensing could enable them to find alternative employment. CHF coordinated the program with Semuthu Fisheries Cooperative Society as the implementing agency, helping five community members obtain professional licenses through Dive Sites Lanka Co. All of the licensees were used as professional divers in the underwater assessment conducted for the preparation of management plans for five fisheries sectors. Two of them have completed the final interview for foreign employment as a lifeguard in the Middle East, and other employment opportunities have been identified.

5. Tilapia farming: One family in the village was assisted with tilapia farming as an alternative to sea bass culture. A fisheries specialist assisted with the design of a pond, and 1,000 red tilapia fingerlings were purchased from the Inland Fisheries Station. The family received initial pellet feeds and guidelines on producing and using feed. To ensure quality, arrangements were made for the fisheries specialist to conduct continuous monitoring.

Eligibility for participation in alternative livelihood investments does not depend on conservation actions, and success of the livelihood activities does not depend on maintaining coral reefs. However, the selected beneficiaries were all chosen because they directly or indirectly depend on Bar Reef, as the goal of the program was to divert labor from destructive activities to more benign ones and to reduce pressure on marine resources.

The project is looking to secure long-term financing through the GEF Small Grants Programme. It is not clear what inputs will be required over the coming years to sustain livelihood projects, or at what point new livelihoods will be self-sustaining. The project does not currently have the capacity to measure improvements in resource conditions. Nevertheless, project staff believes that pressure on the reef system is being reduced by the alternative livelihoods, as the frequency of fishing has been observed to decline with increased time spent on home gardens and sea bass cultivation, for example.

Reasons for selecting Kudawa as a pilot site included several factors that contribute to likelihood of success (Banda et al. 2007): degree of livelihood dependency on the Bar Reef ecosystem; a traditional fisheries village that depends on both lagoon and marine resources; low level of complexity within the community; small geographic area; easy accessibility and diversity of livelihoods; permanent nature of the fishing community; high percentage engaged in diving for fishing. The main strengths of the program are the formation of a Bar Reef surveillance committee, development of new livelihoods, and enhanced capacity of fisheries societies. In addition, the SLED process has been used to link livelihood initiatives with resource management, such as drafting reef management plans. The main weaknesses are lack of monitoring and project management capacity, short project time horizons, insufficient market feasibility studies for the livelihood alternatives, and lack of enforcement of regulations. Other issues to be addressed in the coming years are unregulated tourism and development of new, less-destructive fishing gears.

According to interviews, community members believe that the SLED process is different from earlier livelihood interventions. First, SLED is a gradual process and livelihood development only takes place when the community agrees—the livelihoods are not imposed by outsiders. Second, earlier projects focused more on outside resources and did not consider the local context, in contrast to the SLED projects that focus more on using local resources and consistency with the social environment. Finally, in comparison to previous projects, SLED incorporated a higher degree of interaction between the community and the field team. SLED team interviews suggest that 90 percent of

respondents have come to recognize their ability to engage in livelihoods other than fishing, 80 percent understand opportunities for alternatives, and 75 percent of members involved in the SLED process expressed willingness to engage in introduced livelihood options. This building of confidence and relationships within the community is seen by project implementers as being integral to long-term conservation success.

Banda, R., I. Ranasinghe, U. Mallikarachchi, R. Pallewatta, N. Dissanayake, M. Nusry, and A. Haleem. 2007. *Report on Coral Reef and Livelihood Initiatives. Field Work Challenge – Kudawa and Uchchimunai Villages at Bar Reef, Kalpitiya in the Northwestern Province—Sri Lanka.*

IMM 2008. *Sustainable Livelihood Enhancement and Diversification – SLED: A Manual for Practitioners.* IUCN, International Union for the Conservation of Nature.

iii. Baraulu sewing, Solomon Islands¹⁸

The villages of Baraulu and Bulelavata are located on a barrier island and on the New Georgia mainland, respectively, in the Roviana Lagoon, in the western Solomon Islands. The marine area around Baraulu contains different inner lagoon habitats, such as seagrass beds, sand banks, shallow reefs, and inner lagoon pools. Certain sites in the area are important for green (*Chelonia mydas*) and hawksbill (*Eretmochelys imbricate*) turtles and bumphead parrotfish (*Bolbometopon muricatum*). It is a nursery area for bumphead parrotfish and a spawning aggregation area for triggerfish, snappers, and emperor fish (Aswani 2004). The mangroves in the area are important for saltwater crocodiles (*Crocodylus porosus*) and various species of mangrove, fish, crustaceans, and shells. The area is used by Baraulu and Bulelavata villages for fishing and gleaning, including two bivalve mollusk species: riki (*Anadara granosa*) and deo (*Polymesoda* spp.). These mollusks among others are of particular importance to women's livelihoods.

In 1999, the Baraulu and Bulelavata communities agreed to close two large mangrove areas (34 hectares) to shellfish gathering during the daytime high-tide season from September through May to reduce overexploitation. The area was selected for closure due to high fishing pressure and anecdotal evidence of decrease in shell size and abundance (Aswani and Weiant 2003). The closure was planned for only two years but has remained in place. This type of spatio-temporal closure is similar to traditional practices in the area. A small-scale sewing project was also implemented to offset the income that women lose by not selling shells during those times. The project also assisted with construction of a women's hall in 1999 and a school and clinic in 2002. A women's hall also was built in Bulelavata in 2001. Positive experience with the temporary closure led the community to establish a 103-hectare permanent closed area in 2002. The purpose of the MPA was to protect bumphead parrotfish nursery areas and to restore habitat (Aswani 2004).

Biological monitoring results indicate that the project appears to be achieving its goal of protecting specific marine resources valuable for nutritional consumption and income. Although there have been poaching incidents and compliance is incomplete, the results are most likely better than if the closures had not been established. However, the sewing project had less positive results, and ceased to operate. There appear to be two main causes of failure. First, due to disputes and jealousies between rival groups about the location of sewing machines and distribution of benefits, women were unable to cooperate and sustain the project. Second, the overall context presents several challenges to alternative livelihood projects.

Disputes of the kind that undermined the sewing project are fairly common for the area. Similar issues arose for many of the infrastructure projects in Baraulu/Bulelavata and throughout projects in the Solomon Islands. For example, in the case of the Baraulu clinic, conflicts between certain people in the village paralyzed construction for more than five years. Accounts of the conflict vary, ranging from financial irregularities to interpersonal animosities, but in any case these conflicts led people to poach in the MPA

¹⁸ Additional information provided by Shankar Aswani (University of California, Santa Barbara).

and refuse to participate in activities associated with the program. This cultural reality must be faced by any community-level project in the Solomon Islands.

The sewing project encountered difficulties that will complicate most interventions in the area, but also some that are particularly problematic for alternative income schemes. In addition to challenges relating to tenure, collective action, disputes, and jealousy, alternative livelihoods projects face the additional obstacles of requiring consistent markets for the product, transportation to those markets, reliable people that can handle the finances, and some entrepreneurial skills and knowledge—conditions that are very difficult to meet in this remote location. One alternative livelihood that does exist in the village is a kiosk that sells basic supplies, but it is not very profitable because of a low initial profit margin and because many people demand to purchase goods on credit. Aswani et al. (2004) state, “Given the widespread failure of cash-generating enterprises in the region, we have assisted some communities with building low-cost infrastructural projects such as schools, clinics, and community halls, but only when the communities provide labor and timber and cover other expenses (e.g., fuel for chainsaws).” The demanding enabling conditions for alternative livelihood projects prompted a shift in project focus to infrastructure projects that are more likely to benefit the community as a whole and are less dependent on these additional conditions.

In addition to the setbacks to the sewing project, disputes and jealousy have also led to poaching in the closed areas. Poaching often is driven by personal disputes rather than the lack or existence of economic benefits relative to costs. Therefore, although development investments are viewed as compensation, they do not necessarily deter people from poaching. These social norms and the lack of a respected authority in many areas complicate the design of a conservation and development program that eliminates poaching. In theory, traditional leadership could help reduce poaching, but in many villages traditional leaders are no longer trusted or respected. Given the lack of a strong authority within (or outside) the village, there are few institutional means to control behavior. However, there is a move for the Christian Fellowship Church (CFC) leaders to write marine conservation into their constitution and to begin supervising the Resource Management Committees in all CFC villages.

After this failure of an alternative livelihoods project, the program coordinator decided that declaration of MPAs should be accompanied instead by benefits that could be shared at the village level and something that does not require so many conditions (e.g., cooperation, markets, transportation) to succeed. There are no plans for additional alternative livelihoods projects. Instead, the program is pursuing projects that are loose forms of incentive agreements.

Aswani, S. 2004. *The Roviana and Vonavona Lagoons Marine Resource Management Program Final Report (Phases 1 and 2) 2000-2004*. Department of Anthropology, University of California, Santa Barbara.

Aswani, S and P. Weiant. 2003. Shellfish monitoring and women's participatory management in Roviana, Solomon Islands. *SPC Women in Fisheries Information Bulletin* 12: 3-11.

iv. Cagayancillo tourism entry fee, Philippines

Tubbataha Reefs Natural Park (TRNP) is located in the Philippines in the center of the Sulu Sea. It is part of the Coral Triangle, an area known to have the highest marine biodiversity on earth. The TRNP was designated as the country's first national park in 1988, and now covers an area of 96,828 hectares harboring a wealth of marine life including 396 species of corals, about half of the world's total. There are also at least 483 species of fish, two species of marine turtles, and nine species of dolphins and other marine mammals. Manta rays are commonly found in the reefs, and pelagic fishes such as tuna, mackerel, jacks, and barracudas are observed in schools near the reef crests. The park includes two uninhabited coral atolls and a reef with active reef platforms that are mostly submerged. Recognizing its importance, the park was inscribed as a UNESCO World Heritage Site in 1993 and was included in the Ramsar List of Wetlands of International Importance in 1999. The TRNP is under a no-take policy that bars all human activities except tourism, research, and management. The overall management goal is to preserve the globally significant biological diversity and ecological processes of Tubbataha.

The main threat to biodiversity in the TRNP is illegal fishing. Fishers from other coastal communities in the Philippines enter the Park to harvest protected species such as the snail *Trochus niloticus* and to fish in the reefs. The lucrative live-fish trade and the demand for ornamental marine products such as turtles and clams draw fishers from as far away as Taiwan and China to poach in Philippine waters, including the Tubbataha Reefs (Dygico 2006). One of the driving forces behind illegal fishing is the weakness of the judicial system.

The enforcement system is considered the core around which other management systems of TRNP operate. In fact, 80 percent of the budget is allocated to law enforcement. The system handled 62 intrusions between 1995 and 2004. Of these, 16 resulted in the filing of court cases. Six cases were dismissed, and 10 resulted in an administrative fine. From 2005 to 2008, 24 intrusions were intercepted. In one of these cases, 30 Chinese poachers were apprehended inside the park on December 21, 2006, with 800 live fish, including 300 napoleon wrasses. This year, 45 fishermen from Cebu were caught by the rangers of TRNP gathering *Trochus niloticus*.

One of the strategies included in the program is the implementation of community-based livelihood projects linked to sustainable resource management, in order to compensate Cagayancillo residents who have forgone fishing access to the park. Thus, in a stakeholder workshop in 1998 it was agreed that seven percent of the tourism entry fee would go to the municipality of Cagayancillo. Since then, the share allocated to the municipality has been increased to 10 percent. In 2004, the municipality share amounted to PhP435,000 (nearly US\$8,000). Several projects have been funded in the Cagayancillo using the municipality's share of TRNP fees. Fifty percent is being allocated to municipal road construction. The other fifty percent is being channeled to the Cagayancillo Pangabuhian Foundation, Inc. (CPFII), a microcredit facility to support livelihoods. The CPFII was set up by the Tubbataha Protected Area Management Board

through WWF-Philippines. A seed fund of PhP500,000 from a David and Lucile Packard Foundation grant and a counterpart allocation from the Coastal Resource Management fund of the municipality in the amount of PhP500,000 serve as the total livelihood fund. In 2003, the credit portfolio gave priority to loans and marketing support for seaweed farming. In addition, basic commodities (i.e., rice and fuel) have been provided, as well as loans for educational, health, and other emergency needs.

The CPFPI is a cooperative with a membership of 306 in 2005, representing 31 percent of households. The CPFPI is open to all residents of Cagayancillo. Each member becomes a shareholder by providing an initial contribution of PhP100. One of the criteria for membership includes a pledge that the member will never take part in any activity that will harm the environment. A mechanism for savings also has been incorporated into the fund management system. The total amount borrowed from the CPFPI increased 66 percent from PhP478,666 in 2003 to PhP710,739.34 in 2005. The foundation charges only three percent interest on loans to its members, of which one percent is returned to the borrower through their savings account. If a member of the CPFPI is found guilty of committing harm to the environment, then he will lose his membership to the foundation. To date, no such cases have arisen.

As of 2004, there were about 250 loan recipients. From the start of its operation two types of loan have been offered by foundation: livelihood loans to support enterprise development and salary loans that enable individuals to borrow against future income. To date, 80 percent of loan applicants used the money to finance their businesses. Almost all loan applications are approved. The wait time for the release of a loan can be as long as one month. Because of low repayment rates in 2006 and 2007, a new system was introduced to encourage higher repayment rate of loans: (1) weekly collection (as compared to monthly collection in the old system) and (2) group loans (5 members in a group). In addition to this restructuring, it is believed that members of the foundation should be provided with additional training on technical, financial, and management aspects of operating a business. Cooperative members also need to learn more about other livelihood opportunities that will provide higher return on investments. These business opportunities must be assessed in terms of marketing, technical, management, and financial feasibility. Transportation and post-harvest facilities should also be made available to the residents of Cagayancillo.

The project raises a large amount of revenue through the tourism user fees, but the park still struggles with long-term financial sustainability. So far, conservation fees paid by dive tourists remain the main source of income of the park. Revenues are not sufficient to sustain the high cost of managing an offshore marine protected area (MPA) like Tubbataha. Other sources of revenue are provincial allocations, savings from past projects, fines and penalties, proceeds from the sale of souvenirs, and interest from deposits. The funds from these sources go to the interest-bearing Special Conservation Trust Fund of TRNP. Although the diversity of financial sources for TRNMP operations exhibits a positive result of private-public sector partnership, it is not adequate to cover the cost of park maintenance. Furthermore, a three-fold increase in the area of the TRNP in 2006 greatly increased the enforcement needs, but the budget remained the same. The

proceeds from tourism fees fluctuate from year to year and usually cover fifty percent of the core cost. Eighty percent of the operating cost goes to enforcement. The Philippine Navy and Philippine Coast Guard currently cover a large portion of the cost of maintaining current enforcement intensity. It is unknown how long the agency will be able to continue the support. Thus, a sustainable financing scheme is very much needed by the TRNP.

Dygico, M. 2006. *Tubbataha Reefs: A Marine Protected Area that Works: A Case Study on the Philippines*. WWF-Philippines. Available at www.wwf.org.ph/downloads/TubbatahaCaseStudy.pdf

v. Gilutongan Marine Sanctuary tourism revenue sharing, Philippines

Gilutongan Marine Sanctuary (GMS) is located in the province of Cebu in the Philippines. All of the islets and the main island can be characterized as coral reef islands with elevation of not more than 10 meters above sea level. Among the reef fishes are grouper, wrasse, sweetlips, emperors, fusilier, goatfish, spinecheeks, butterflyfish, surgeonfish, rabbitfish, needlefish, parrotfish, and mojarras. Gilutongan's reefs were degraded by a combination of overfishing and reef destruction caused by fishermen using dynamite and cyanide. The GMS was declared as a MPA to conserve, protect, and maintain the integrity of coastal and marine resources. GMS is one of the country's few urban MPAs as it is located within twenty kilometers of a metropolitan area. It is approximately six kilometers from Mactan Island and the nearby metropolitan area of Cebu City, which is the second largest urban area in the Philippines in terms of population and one of the major coastal tourist destinations in the country.

There are approximately 260 households on the island. Residents of the Barangay (village) of Gilutongan principally pursue seaweed farming and fishing, and with the influx of tourists in the sanctuary they also earn income from lifeguarding, tour guiding, food catering, and vending. Approximately 200 families or 77 percent are engaged in seaweed farming. Gilutongan island is some seven kilometers away from the town proper, reachable by a 25- to 30-minute boat ride. A generator on the island provides electricity from 6 pm until 11 pm, and water is sourced from the mainland or collected in rainwater reservoirs.

In 1991, a ten-hectare marine protected area (MPA) was established with technical assistance from the Cebu Resource Management Office (CRMO). Five years later, the municipality adopted a municipal ordinance for the sanctuary with the assistance of the Philippines Department of Environment and Natural Resources (DENR) and funding from the U.S. Agency for International Development (USAID). Under current Philippine laws and the decentralized system of governance, the local government unit (LGU), in this case the municipality of Cordova, has direct administrative jurisdiction and management responsibilities for coastal resources within an area extending up to 15 kilometers from their municipal shoreline. In 1999, the Gilutongan community renewed their interest in protecting the sanctuary, and the GMS was expanded to a 14.89-hectare no-take marine reserve. Among the critical issues reported by local residents were overfishing, habitat destruction, lack of law enforcement, a need for livelihood opportunities, poor environmental awareness, economic losses from environmental degradation, and lack of electricity and potable water.

The GMS is managed by the Gilutongan Marine Sanctuary Board, a multi-sectoral body composed of representatives from the municipal and barangay government units, fishers' organizations, private organizations, and non-government organizations. The GMS Board has been operating under a 2001–2003 management plan that has not been updated. The plan included mechanisms for collecting fees, multiple-use zoning, and other regulations. Monitoring of coral reefs and reef fishes is conducted twice per year.

Approximately fifty percent of the island dwellers were opposed to the creation of the sanctuary because of having to forego access to the area. Illegal fishing was prevalent until 1999 with the revitalization of the sanctuary program, including training and loans. The GMS relies on enforcement of the sanctuary and incentives to residents in the form of a share of tourism revenues. The expectation is that a well-protected sanctuary will generate more tourism and that more tourism will result in more shared revenues. According to sanctuary staff, there have not been violations of the sanctuary rules.

The ordinance that established the GMS includes a tourism revenue-sharing scheme between the local community (Barangay Gilutongan residents) and the municipality of Cordova. The municipality receives seventy percent and the Barangay Gilutongan receives the remaining thirty percent. In June 2008, the municipal government entered into a memorandum of agreement with private-sector operator Hei-yang Sports Incorporated. The agreement stipulates that Hei-yang Sports shall lease the buffer zone for PHP500,000 per month as the sole tourism operator. The lease fee is collected by the municipal government, which retains sixty percent of the net revenues. The Barangay Gilutongan receives thirty percent, and five percent shares are distributed to the United Municipal Employees of Cordova (UMEC), which assists in marketing and promoting the sanctuary, and the Accredited Umbrella Fisherfolks Organization, which includes local fishers who contribute to monitoring and enforcement activities. Hei-yang Sports agreed to hire two residents of the island on a one-week rotational basis to serve as boatman and fee collector. Other accredited dive-shop operators must pay an entrance/dive fee to Hei-yang Sports, if they wish to enter the GMS.

Alternative livelihoods are being promoted by non-government organizations (NGOs) in order to reduce dependence on the reef. Among these are seaweed farming and tourism-based activities (catering, lifeguarding, boating service, selling of souvenirs). Soft loans are also being made available in order to finance the possible livelihood sources. Each household received PHP500 payable within four months with an interest charge of PHP50. Only ten percent of those who accessed the micro-loans repaid the principal and interest (Jury Ompad, pers. comm.) Unfortunately, the borrowers claim that they have no money at present and will only pay once they have money available.

The operation of the sanctuary requires an annual budget of PHP1 million to cover information, education, and communication activities, consultant salary, supplies, and the maintenance of enforcement boats, guardhouse, and mooring buoys. The lease fee for the buffer zone at PHP500,000 per month is the largest source of income of the sanctuary. The lease contract ended in December 2008, after which the municipal government was waiting for Hei-yang Sports to decide whether to renew the arrangement.

In terms of outcomes, there is some evidence of increased fish density inside GMS (i.e., trend inside GMS is increasing more than outside the sanctuary). Among the strengths of the project is the strong community commitment backed up by strong municipal government support, as well as NGO support in the form of training, funding, and technical expertise (Reef Check). The presence of MPA enforcers is reported to have reduced the incidence of illegal fishing in the adjacent areas of GMS.

One issue with the project is disputes concerning the revenue sharing. Municipal officials claim they have given the allocated share to the Barangay officials each year. However, residents question what happened to the funds, as village officials claim they did not receive the funds. With the large amount given to the Barangay government, intended for the trainings/seminars, honoraria for women, law enforcement, medicines, garbage collection, and the livelihood program, the Barangay government must ensure that its constituents are consulted and aware of how the thirty percent share was utilized.

Another concern is the sanctuary's carrying capacity for tourism. A study conducted in 2004 suggested that recreational diving in Gilutongan far exceeded the 5,000 to 6,000 dives per year considered in previous studies to be the carrying capacity of coral reefs for SCUBA diving (Hawkins and Roberts 1997). It is expected that as diving intensity increases, coral damage at GMS will also increase.

Hawkins, J.P. and C.M. Roberts. 1997. Estimating the carrying capacity of coral reefs for recreational scuba diving. Proc. 8th Int. Coral Reef Symp., Panama, 2, 1923-1926.

vi. Kubulau dive tag fees, Fiji

The Namena barrier reef system sustains rich fishing grounds for the villagers of Kubulau district in southwestern Vanua Levu, Fiji's second largest island. The Kubulau community consists of ten villages and a number of smaller settlements, whose major livelihoods are fishing, copra, and small-scale farming. Well known as one of the best diving regions in Fiji, the Kubulau fishing ground is home to over 1,000 species of invertebrates, 400 known corals, 445 documented marine plants, and 1,100 fish species. The area also includes a migratory pathway for cetaceans and nesting sites for green and hawksbill turtles as well as seabirds.

Overfishing is one of the main threats in the Kubulau fishing ground. The use of destructive fishing methods such as poisons, small-mesh gill nets, and breaking of corals also contribute to resource degradation in Kubulau waters. Land-based activities also contribute to the destruction of Namena, including a nearby mine that discharges waste into the Yanawai River, which flows into the Kubulau fishing grounds. Logging and agriculture also result in harmful run-off and sedimentation of waterways and reefs.

Rapid depletion of fish stocks became apparent in the mid-1980s, when tuna pole and line vessels fished the Namena barrier reef. In 1996, the chiefs and people of Kubulau stopped this practice and also prohibited crews of tuna fishing boats from bait fishing and drop-line fishing. In 1997, they banned fishing in Kubulau waters by commercial and outside fishermen altogether.

Conservation began in 1984, when the Government of Fiji issued a lease for resort development on Namenalala Island, while declaring the majority of the island a reserve. That year, the resort owners received a letter from the Kubulau chief in support of joint efforts to monitor fishing activity in the Namena area, as the community was concerned about increasing levels of commercial fishing. In 1997, the people of Kubulau, with advice from Moody's Namena Resort, agreed to establish a marine reserve around the Namenalala resort island. The reserve was specifically designed to cover the nearby reef system and protect it from extractive use, as dive tourism is the focus of the resort. Over the years, with growing support from external conservation agencies, the community has established 11 more marine managed areas (MMAs) and expanded the original reserve to cover an area of 70 km². In 2004, a workshop organized by WWF and Wildlife Conservation Society (WCS) identified Kubulau as a conservation priority. Since then, the David and Lucile Packard Foundation and the Gordon and Betty Moore Foundation have supported the Kubulau MMAs with WCS as the main implementing organization.

The MMA network in Kubulau is co-managed by the local community through the Kubulau Resource Management Committee (KRMC), with technical and financial support provided principally by WCS and Coral Reef Alliance (CORAL). The KRMC includes representatives from all Kubulau district villages, and it is supported by an Advisory Panel of representatives from NGOs, government, and industry. The KRMC is guided by traditional and elected community leaders. The MMA network comprises 13 individual zones, including 10 where fishing is prohibited and three that permit

occasional fishing. As a result of the new protected areas, wrasses, groupers, and other depleted fish stocks are beginning to recover. The management framework combines traditional systems with modern conservation approaches. The Fiji Locally Managed Marine Area (FLMMA) network also assists the program by providing research expertise and facilitating resource management workshops.

In the long term, the KRMC aims to make its management activities self-sustaining, with minimal reliance on external support. To this end, CORAL and the KRMC in 2005 collaborated with resorts and dive centers in Savusavu to develop the Kubulau Marine Reserve Business Plan. The core of this plan is a transparent dive-fee system. Stakeholders including the KRMC, dive and tourism operators, government representatives, and staff from CORAL and WCS meet annually to decide how many dive tags each operator will purchase for the following business year. A dive tag can be purchased by an operator for F\$30. In 2007 alone, 1,000 dive tags were purchased, generating F\$30,000 in community funds. The KRMC manages these funds, typically used for community development, scholarships for tertiary students, operational costs such as patrolling, fuel, and mooring maintenance, and other management expenses. All of the eight dive operators who currently use the Namena Marine Reserve comply with the user fee system. In the future, the system may be extended to include dive sites in other protected zones in the Kubulau fishing grounds.

Marine property rights in Fiji facilitate conservation success. The coastal and foreshore water resources are shared under dual ownership, where the state owns the seabed and indigenous Fijians have the right to fish in their own customary fishing rights area (*i qoliqoli*). Another customary marine tenure system in Fiji is recognition of *i kanakana*, the reefs immediately in front of a village. Most decisions regarding *i qoliqoli* are made by local communities. The Fisheries Act allows *i qoliqoli* owners to advise the District Commissioner or the Fisheries Division which commercial fishermen shall be allowed to fish in their area, and also to impose restrictions on commercial fishermen. This system is an important measure for marine conservation as it controls resource access. However, a major concern is the erosion of traditional management due to population growth, modern fishing technologies, and the development of the cash-based economy resulting in commercial exploitation of resources, breakdown of chiefly authorities, and loss of traditional knowledge. In Kubulau, customary laws and traditional governance institutions may be sufficient to ensure adherence to the MMA, but enforcement issues arise in relation to adjacent *i qoliqoli* and outsiders.

Efforts are underway to secure legal recognition of the Kubulau MMAs and address enforcement against poaching activities by outside, unlicensed fishers. This includes training of community wardens, establishment of a ranger station, and purchasing an enforcement boat and radio equipment. Currently, surveillance is carried out jointly by honorary fish wardens from each village, Moody's Namena Resort, and the local community as a whole, since all MMAs are close to a village or settlement, or the resort. Moody's Namela Resort plays a crucial role in the enforcement and surveillance program. Being situated far from the mainland, the resort remains alert to suspicious activities within the MMA and briefs the staff members on the importance of deterring

people from fishing in this no-take area. When poachers are detected, resort staff telephone the fish wardens on the mainland, who travel to the site and seize fishing gears, which are then taken with the suspect to the nearest police station. Poaching by community members is rare, and the poaching threat is mainly from outside fishermen who reside in neighboring villages and the main urban centers. When poaching by locals does happen, the cause typically is internal disputes and frictions. For instance, members of one village occasionally fish inside protected areas to convey their dissatisfaction with KRMC decisions on distribution of benefits.

The Kubulau program can demonstrate success on the basis of annual biological monitoring efforts since 2004, conducted by staff from various conservation organizations (WWF, Greenforce, WCS, and other FLMMA partners) and trained community members. Socioeconomic monitoring was conducted in 2005 and replicated by WCS in 2007. These efforts suggest widespread satisfaction and support for the program, motivated by the benefits derived from dive-tag fees as well as the desire to protect resources for the future. However, long-term sustainability remains a challenge. At this stage, the MMA program in Kubulau continues to rely on technical and financial support from partner organizations and donors. However, capacity building over several years, together with full community participation in planning, design, implementation, evaluation, and decision-making, has put in place many of the conditions needed for sustainability. Being situated close to Savusavu, a leading tourism destination in Fiji, further enhances the potential for the Kubulau MMAs to become financially self-sufficient.

*vii. Pohnpei sponge and coral farming, Federated States of Micronesia*¹⁹

Pohnpei Island is a mountainous volcanic island located slightly north of the equator in the western Pacific Ocean. It is the largest island in the Federated States of Micronesia (FSM), a sovereign state in free association with the United States. Pohnpei has an extensive barrier reef situated two to four kilometers offshore. Inside the lagoon, a well-developed fringing-reef complex with associated seagrass beds and mangrove forest is home to a large number of species (Burgoin and Joseph 2008). Pohnpei also includes eight smaller islands and atolls. According to recent studies, unsustainable fishing practices are threatening the local commercial coral reef fisheries, and a substantial proportion of some species (serranids) enters Pohnpei markets at immature sizes (Rhodes and Tupper 2007, 2008). Fishing is mainly nighttime spearfishing, which is difficult to monitor and may cause excessive pressure on certain species. Fifty-four percent of Pohnpei's population is unemployed, while 11.1 percent of the total workforce (over 15 years of age) is involved in agriculture or fishing (Rhodes et al. 2008). It is estimated that there are 756 commercial and 1,408 subsistence farmers and fishers (Rhodes et al. 2008).

In 2001, the Conservation Society of Pohnpei (CSP) began working with communities to re-establish State-sanctioned Marine Protected Areas (MPAs) within Pohnpei lagoon. Eleven MPAs have been designated by law, and CSP currently works with seven of these areas. To provide additional income-generating opportunities, CSP partnered with the Marine and Environmental Research Institute of Pohnpei (MERIP) to establish sponge farming with MPA communities around Pohnpei. In 2005, income-generating activities were expanded to hard coral, soft coral, and other marine invertebrate farming.

There are currently 19 sponge farmers in the communities of Enipein, Parem, Dehphek, Mwand, Lenger, and Temwen. The primary method of sponge and coral reproduction is cloning (asexual budding). Thus, a fragment of sponge or coral that is removed correctly from the parent colony will heal to form a new colony. The farmer ties pieces of the parent sponge to lines set up in the water column, and the sponges grow over a period of two to three years until harvest. Each sponge farm has 700 to 1,000 pieces. The farmer must clean the sponges of biofouling approximately once a month (frequency depends on the currents and other aspects of the site). MERIP harvests from the farms three or four times per year and pays the farmers \$1 per piece. Sponges are processed and packaged for sale as bath sponges. Lower-quality sponges are sold locally for \$4-5, and the higher-quality sponges are sold primarily through Trade Aid New Zealand, a fair-trade store with approximately 30 locations in New Zealand. In 2008, Pohnpei sponge farmers sold 3,500 grade A sponges and 1,000-1,500 grade B. The market potential has been estimated at 30-40,000 sponges per year.

Coral farming uses a similar process as sponge farming. Corals are harvested from a brood stock and grown on metal grids. Coral farming has been more successful than sponge farming as they are faster growing, and there is a good market for corals for home

¹⁹ Additional information provided by Simon Ellis (Marine Environmental Research Institute of Pohnpei), Shaun Cronin (Marine Environmental Research Institute of Pohnpei), Eugene Joseph (Conservation Society of Pohnpei).

aquaria. MERIP harvests corals from community farmers, and any shortfalls in supply are met through MERIP's central coral farm, which has a standing stock of approximately 15,000 corals for this purpose. The Marshall Islands Mariculture Farm (MIMF), the largest commercial producer of farmed giant clams and corals in the Micronesia region, purchases all the corals that MERIP can supply. In 2008, MERIP sold 6,000 corals. The market potential has been estimated at 20,000 corals per year.

The benefits provided by the project are assistance (materials, expertise) with setting up sponge and coral farms, and \$1 per sponge or coral that MERIP harvests. Coral farmers and productive sponge farmers receive about three or four payments per year, with each payment on the order of \$50-300. MERIP also paid farmers to set aside 25 percent of their sponges as brood stock in 2008, in an effort to make the farms more environmentally sustainable. As much as possible, MERIP attempts to harvest during periods of financial need, such as one month before Christmas or Easter holidays. Persons residing in a community that has declared a MPA are eligible to receive MERIP assistance for setting up a farm. MERIP will harvest any pieces from farmers that are the appropriate size and quality, and thus there are no additional requirements for receiving the per-piece payments. Sponge and coral farm sites were chosen for their appropriateness for farming and their proximity to MPAs. Recently, MERIP has focused on recruiting farmers in Parem because it is a major fishing community and it is situated between two MPAs. Otherwise, there has not been a focus on engaging specific communities or individuals to reduce their impacts on reefs or MPAs, or because they are heavily engaged in fishing. There are currently 18 sponge farms and 5 coral farms.

The overall goal of the project is to sustainably improve the living condition of the most impoverished coastal communities in Micronesia through sustainable small-scale mariculture ventures. One of the long-term objectives is to decrease the stress on traditional resources. It is unclear at this point to what extent the MPAs are having a positive impact on marine resources because it is impossible to determine whether the differences in fished versus protected areas are due to initial differences in size or habitat quality, fish dispersal patterns, or effectiveness of the MPA. Similarly, the effect of sponge and coral farming on marine resources is even less clear, as there are no measures of fishing effort or compliance with MPA rules before and after the farming program was established. Although the extent of illegal encroachment has not been quantified, community conservation officers state that fishing activities are occurring within the boundaries of outer reef MPAs. Those participating in the sponge and coral farming are likely slightly better off than before the project, since they are not required to give anything up (apart from minimal amounts of time), and they receive cash when their sponges and corals are harvested.

The sponge and coral farming project has been successful in several respects. As opposed to many alternative livelihood options that require a great deal of infrastructure and skills, the farming enterprise is quite simple. Production requires relatively few inputs and low labor and technical expertise. Growing the corals and sponges is environmentally benign and mainly requires good water flow and some cleaning. The products have no predators, and thus losses are minimal. To date, there have been no problems with diseases. The

sponges have somewhat of a local market, which eliminates the need for complex arrangements or costly transportation. There is also a good market for sponges and corals outside of Pohnpei. MERIP's involvement has greatly assisted with finding export opportunities and organizing production at a scale that can supply the market. Over the coming years, the project is attempting to increase the number of beneficiaries and further diversify alternative livelihoods.

In addition to these strengths, the project has also met with a number of challenges. Sponge farming in particular has been difficult to establish. In order for it to be profitable, a certain volume of sales is required, but villagers have been reluctant to take up farming or to expand production beyond current low levels. The main issue appears to be the long interval between establishing a farm and receiving payments from harvest. MERIP is considering offering an alternative system where anyone can work as a day laborer on a central MERIP sponge farm and receive a wage. This will permit more people to benefit from sponge farming and receive immediate payment, without having to take on the investment of their own farm. In addition, this is likely to increase the efficiency of the system. MERIP must invest substantial resources (staff time, fuel) in visiting the farms, identifying new farmers, getting people to spend time on their farm, cleaning farms that are not being adequately maintained, and harvesting the products. A central farm could still provide employment for people and likely would be more profitable. The profits could be invested in the communities and the MPAs.

In many other locations where alternative livelihoods are implemented, there is a perception that severe resource depletion is occurring because of a lack of other opportunities. Thus there is a crisis in terms of both human wellbeing and biodiversity. In Pohnpei, severe depletion has not yet occurred, and alternative livelihoods are less likely to divert people's labor from destructive activities. It is still possible to make a living from fishing, and current livelihood options are sufficient for meeting most needs, particularly because healthcare and education are provided by the State. Reaching a higher level of material wealth generally is pursued through other professional avenues or employment in the U.S., rather than small-scale income generating projects. However, the farming programs can provide a source of diversification to fishermen and perhaps help transition towards other livelihoods to prevent future crises.

Although coral and sponge farming offer low-impact, potentially profitable strategies for income generation, it is unlikely that they are serving as major drivers of marine conservation. Overall, it seems that the farming is not expected to replace or even reduce fishing effort, thus it serves as a complement rather than substitute for fishing. Apart from the fact that the farms are established with MPA communities, there is no real link between respecting the MPA and participating in alternative livelihoods. Although developing new income generating activities that are not destructive to the environment is a worthwhile pursuit in itself, its link to the MPAs and its impact on conservation should not be overstated.

The sponge and coral farming project in Pohnpei is an example of a locally appropriate, well-chosen strategy that has the potential to provide extra income to community

members. It is not currently being used as an incentive for conservation *per se*, since participation in the program or profitability of the farming does not depend on conservation behavior. While it may not be producing a demonstrable impact on marine resources, in terms of decreasing fishing effort or increasing compliance with MPAs, it does offer an environmentally benign income source in an area where these are few and far between.

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Ellis, S., E. Ellis, W. Lohn, M. Haws, and Q. Fong. *Farming the Micronesian Wool Sponge* (*Cosinoderma matthewsi*). Pacific Aquaculture and Coastal Resource Center at the University of Hawaii Hilo.

Rhodes, K. L. and M. H. Tupper. 2007. A preliminary market-based analysis of the Pohnpei, Micronesia, grouper (*Serranidae: Epinephelinae*) fishery reveals unsustainable fishing practices. *Coral Reefs* 26(2): 335-344.

Rhodes, K. L., M. H. Tupper, and C. B. Wichilmel. 2008. Characterization and management of the commercial sector of the Pohnpei coral reef fishery, Micronesia. *Coral Reefs* 27(2): 443-454.

*viii. Port Honduras Marine Reserve Alternative Livelihood Training (ALT), Belize*²⁰

Established in January 2000, Port Honduras Marine Reserve (PHMR) covers approximately 160 square miles and is an integral part of the Maya Mountain Marine Corridor (MMMC) in southern Belize. The reserve is located just off the coast of Punta Gorda and extends north to Monkey River Village. PHMR comprises all the coastal wetlands, sea, seabed, and national lands within the area known as Port Honduras. Rapid Ecological Assessments of the MMMC in the 1990s revealed that the area that is now the PHMR serves extremely important ecological functions of regional significance. The PHMR is rich in biodiversity and contains approximately 138 small mangrove islands, which provide essential habitat and nursery for juvenile aquatic species. Other critical habitats include seagrass beds, hard bottom communities, and soft bottom communities. A large portion of the reserve is inhabited by seagrass, which also provides essential habitat and food for juvenile fish species, sea turtles, saltwater crocodiles, and manatee. The conservation area of the reserve contains fringing reefs and several coral patches and coral heads, which provide habitat for vertebrates and invertebrates. Twenty-two thousand people of the Toledo District, and even more people from neighboring Guatemala and Honduras, rely directly and indirectly on these natural areas for their livelihoods. Fishing and farming have been the traditional uses of the land and sea resources in the MMMC. In the villages of Monkey River and Punta Negra, which buffer the Reserve, most residents are commercial fishers, tour guides, or fly-fishing guides, and they depend on the Reserve for their livelihoods.

Under the Fisheries Amendment Act of 1983, the Belize Fisheries Department is ultimately responsible for the establishment and implementation of marine reserves. However, the Fisheries Department entered into a formal agreement for co-management of the PHMR with the Toledo Institute for Development and Environment (TIDE). Management arrangements made with the Fisheries Department stipulate that TIDE is responsible for (1) day-to-day management of the PHMR, (2) proper implementation of all aspects of recreation, (3) providing the Fisheries Department with annual financial statements and reports, and (4) collecting user fees.

After a baseline assessment in 2001, a management plan for the reserve was developed in 2002. Since that time, TIDE has worked closely with partner organizations and community members to prevent illegal activity in the Reserve and to promote sustainable alternative livelihoods for displaced fishermen. The historic use of PHMR has been fishing, including fishing by foreign nationals from neighboring Honduras and Guatemala. Many of the Belizean fishers in the area complain of illegal fishing activities by foreign nationals and attribute the reduction in certain fish stocks to such activities. Based on recommendations of a PHMR Management Effectiveness study that was completed in 2006, TIDE has been bolstering its scientific research program and diversifying alternative livelihoods options to improve PHMR management.

Park rangers are posted at the PHMR ranger station and rotated on a bi-monthly basis. The rangers patrol the reserve to reduce threats such as gill net use, illegal fishing,

²⁰ Additional information provided by Celia Mahung (TIDE).

overfishing, and under-sized catch. These patrols help to monitor activities in the conservation no-take zone and the preservation zone. In addition, the rangers support TIDE's public relations by conducting community meetings, and they play an active role in research activities conducted within the Reserve. TIDE supplements this enforcement presence with a community ranger program, in which local fishermen and tour guides are trained to assist staff rangers through an integrated communications system.

In 2007, a majority of the community rangers' reports of illegal activity resulted in an arrest or confiscation of illegal equipment. In cases of arrest, TIDE rangers transfer detainees to the Fisheries Department, which then carries out the prosecution. Joint patrols (rangers along with the Belize Defense Force or the Police Department) are also conducted. TIDE rangers have the legal authority to confiscate equipment and vessels, and the Fisheries Department decides what happens to the confiscated items in the course of prosecution.

Recently, TIDE has made significant investments in patrols and surveillance. Over the years, there has been an increase in the number of patrol boats and in the fleet of vessels. In 2007, 750 patrols were conducted in the PHMR. Surveillance goals include:

- Minimizing illegal fishing, hunting, and logging pressure.
- Educating local residents about the goals of conservation and the rules and regulations of the area.
- Monitoring of flora and fauna to determine the impacts of management.

In 2007, 34 gill nets and 5 long lines were confiscated, 2 arrests made, and 8 warnings given. More than 60 joint patrols were carried out in the Marine Reserve, and approximately 20 percent resulted in arrests for illegal activity or confiscations of illegal gear. In recent years, the people who were arrested, warned, or had equipment confiscated included both locals and foreigners. Although most were foreigners, some of the locals actually were involved in the TIDE training programs. The arrests did lead to successful prosecutions, and penalties included fines and confiscation of equipment.

TIDE provides incentives for conservation that range from alternative livelihoods to scholarships to sporting events such as the Freshwater Cup Environmental Football League. Before the introduction of TIDE, conservation efforts in the southern region of Belize were limited. Most of data collection was done through the Ministry of Fisheries and Agriculture. The government was also the main entity responsible for monitoring of all resources in southern Belize. The Alternative Livelihood Training (ALT) program is a partnership model adopted by TIDE to demonstrate sustainable natural resource management with promotion and support for sustainable livelihoods. For the past five years, TIDE has engaged in developing and implementing training programs that facilitate the creation of employment and income opportunities for residents of buffer communities. Residents of Punta Gorda, Monkey River, and Punta Negra have actively participated in ALT since its inception.

The purpose of ALT is to instill a sense of ownership in common resources while protecting them for future generations. The ALT project activities included improving

protection of the Marine Reserve by strengthening TIDE's enforcement and protection capacity, stock assessment of six commercial fish species, promoting conservation and education/awareness, and developing alternative livelihoods through ecotourism and the production of honey from mangroves. Interventions also included the implementation of tourism training in kayaking, birdwatching, flyfishing, scuba diving, tour guiding, hospitality, and small business management. Failure to comply with PHMR laws and regulations would result in removal of the person from the program.

TIDE's ALT program combines skills training with environmental education. There is no additional assistance provided for the alternative livelihoods (e.g., capital, marketing, transportation). ALT participants are expected to participate in training activities ranging from three days to two weeks of formal sessions. The participants receive training from local facilitators who are highly skilled in a range of areas including catering, kayaking, birdwatching, fly-fishing, scuba diving, and tour guiding.

According to Coombs (2008), complete reliance on ALT is not yet practical. Over a third of respondents stated that their income, even when supplemented, is never sufficient to meet their daily household requirements. This sentiment is echoed by the ALT trainees, and consistent with the general economic situation in this district and indeed the nation of Belize and neighboring territories. Representatives from buffer communities suggested that authorities should consider opportunities to relax regulations for seasonal use. Fishermen stated that fishing and harvesting of resources from the sea would continue to complement their livelihood. The trainee group from the ALT program generally has expressed satisfaction with the training quality, content, and pace. The training program generated an expectation that they were being prepared for the arrival of the tourism sector, but since tourism has not taken on the expected growth in Toledo, trainees are increasingly looking for other opportunities to use their acquired skills. All participants of the ALT survey stated that they would like to see a continuation of the current ALT activities. They felt that the training provided them with improved skills and capacities that could impact the standard of living in their communities and households.

Although project implementers believe the program is successful, monitoring data cannot substantiate this conclusion. Biological data indicate a decline in abundance of reef fish, queen conch, and spiny lobster, despite the protection offered by the no-take zones. Surprisingly, the data indicate that the conditions in the no-take zones have been getting worse than the conditions in the general-use zones. It is unclear at this point whether it is because of incomplete data collection, exogenous factors, or some failure of the PHMR. Foster (2008) states that large inconsistencies and missing data makes detailed analysis impossible at this time.

Coombs, J. A. 2008. *Alternative Livelihood Training Critical Review*.

Foster, N. L. 2008. *PHMR: Status of the Park Report*.

*ix. Punta Abreojos cooperative and Marine Stewardship Council (MSC) certification, Mexico*²¹

Punta Abreojos is a small fishing village on the Pacific coast of Baja California Sur, Mexico, within the Laguna San Ignacio wetland complex. This 248-mile coastal wetland ecosystem includes intertidal mudflats, salt flats, sandy beaches, and mangroves that support a great wealth of globally significant biodiversity (Laguna San Ignacio Conservation Alliance 2006).

Twenty-six cooperatives fish commercially throughout the range of the red lobster (*Panulirus interruptus*) in Mexico's Baja California region. Baja California Cooperative Societies Regional Federation (FEDECOOP) was established in 1940 and comprises nine fishing cooperatives, including Punta Abreojos. FEDECOOP represents nine of the ten highest-grossing lobster-fishing cooperatives, including approximately 1,300 fishermen (Fetherston 2005). Cooperative members are responsible for preventing illegal behavior to protect breeding and spawning grounds, and for conducting research on fish stocks to monitor success of management measures. Managed stocks include lobster, abalone, conch, sea cucumber, sea urchin, algae, and more. Each cooperative employs a biologist to aid in data collection and to offer advice and assistance to the cooperative, the federation, and government agencies (Fetherston 2005).

In 1994, the Mitsubishi Corporation and the Mexican government proposed to construct the world's largest salt manufacturing plant in Laguna San Ignacio. A jointly owned subsidiary, Exportadora de Sal, S.A. (ESSA), planned to flood 116 square kilometers of land to create evaporation ponds and to pump 462 million metric tons of water per year. A 1.2-mile-long concrete pier was to be constructed in Punta Abreojos to receive tankers delivering diesel fuel and oil, and exporting the salt. The anticipated impacts of this facility on whales and the lagoon generated great concern, as did the precedent of large-scale industrial development in a biosphere reserve. In 2000, the fishermen of Punta Abreojos, along with a consortium of Mexican and American non-government organizations (NGOs), defeated the salt plant proposal.

Fishermen in Punta Abreojos hold an exclusive concession to its lobster and abalone fishing territory. The local cooperative has been sustainably harvesting lobster and abalone in its exclusive concession for over 60 years with management measures that include enforcement of area closures, restrictions on fishing gear, legal minimum sizes, and protection of gravid females. Aggressive surveillance and policing (radar systems, radio communications, armed night patrols on land and water) of the entire fishing area combats poaching. Clear definition of the restricted area provides a strong legal foundation and facilitates access to credit and commercialization.

In the 1930s in Mexico, the Cardenas government allocated exclusive management rights to fishing cooperatives along the Pacific coast of Baja California. The government assigned rights to high-value species (lobster, abalone, and others) within restricted

²¹ Additional information provided by Geoff Shester (Oceana), Javier Villavicencio (Punta Abreojos fisherman).

fishing territories to specific organizations of fishers (Foote 2003). In general, limited entry or dedicated-access privileges can address the tragedy of the commons and provide incentives to holders of rights for sustainable management of the target species (Costello et al. 2008). When fishing legislation changed in the early 1990s under President Salinas, a federation of Punta Abreojos and eight other lobster cooperatives fought to retain their exclusive management rights. In 1993, they received a new twenty-year concession that clearly delimits their exclusive fishing zone and species access (Foote, 2003). Elsewhere, deregulation and absence of an effective system of permits and licensing resulted in overharvesting of many species.

In 2004, the sustainable lobster-fishing practices and robust management within FEDECOOP empowered it to become the first small-scale community fishery to obtain certification by the Marine Stewardship Council (MSC). As per the MSC process, the independent certification body, Scientific Certifications Systems, Inc., verifies compliance of the federation's fishery management with MSC guidelines and conditions for continued improvement, combined with periodic monitoring and evaluation of stocks. FEDECOOP hopes to secure a price premium for its spiny lobster in the European market, as a consequence of the MSC label, but this has not yet occurred.

In addition, to support MSC certification and general sustainability efforts, Ecologic provided loans to Punta Abreojos fishermen to purchase more efficient, eco-friendly four-stroke engines to replace two-stroke engines on their boats. The Punta Abreojos cooperative took out its first loan of \$100,000 in 2002 to buy ten four-stroke engines. For each of the two following years, they increased their loan by an additional \$50,000 so that by 2004, they had purchased twenty new motors. In addition to reducing one of the biggest sources of contaminants into the waters of El Vizcaíno Biosphere Reserve, the four-stroke motors use on average forty to sixty percent less fuel than two-stroke motors, according to the Ecologic website. Because of the efficiency of the engines, overall lobster-fishing costs were reduced by 16 percent between 2002 and 2003, even with payments of 10 percent interest on the loans.

The economic benefits from this project are mainly sustained profits from maintaining a well-enforced limited-entry fishery for high-value species. In addition, because of the MSC certification, fishermen may in the future receive higher prices or access to new markets for their product.

Costello, C., S. D. Gaines, and J. Lynham. 2008. Can catch shares prevent fisheries collapse? *Science* 321(5896): 1678-1681.

Fetherston, E. H. 2005. *Sustainability Certification in Community-Based Fisheries*. Masters project submitted in partial fulfillment of the requirements for the Master of Environmental Management degree in The Nicholas School of the Environment and Earth Sciences of Duke University.

Foote, W. 2003. Swimming against tide of overfishing. *Los Angeles Times*, December 29.

Laguna San Ignacio Conservation Alliance. 2006. *Laguna San Ignacio Conservation Plan 2006*.

x. St. Croix East End Marine Park interpretive ranger and commercial captain training, USVI²²

Located east of Puerto Rico in the Caribbean, St. Croix is the largest of the US Virgin Islands, an unincorporated territory of the United States. St. Croix has a land area of 214.66 km² and a population of approximately 60,000. The eastern and southern ends of the island feature a barrier reef that is habitat for a variety of corals. An estimated 400 species of fish live in and around the East End Marine Park of St. Croix (TNC 2009). St. Croix also hosts nesting beaches and foraging grounds for several sea turtle species, including green, hawksbill, and leatherback turtles. Sandy Point on the southwest edge of the island is one of the most important leatherback nesting beaches in the area. Some 17 species of seabirds make use of East End Park, including shearwaters, tropicbirds, boobies, pelicans, frigate birds, gulls, and terns (TNC 2009).

A number of threats to coral reefs and fish populations in St. Croix have been identified. These include both proximate sources and distant sources, such as a bleaching event in 2005 that bleached approximately 51% of live coral (Rothenberger et al. 2008). There is some evidence of a trend of decreasing coral cover since 2001, and experts believe that run-off from terrestrial sources has not been managed adequately to date (Rothenberger et al. 2008). Additionally, corals have been declining since the 1970s, when hurricanes and disease began to decimate populations of elkhorn and staghorn corals that formerly dominated shallow reefs. The decline continued in the 1980s, when the massive die-off of the long-spined black sea urchin occurred. Overfishing of large herbivorous fish (e.g., parrotfish, surgeonfish) is an issue of concern in the area, as it can cause shifts from coral- to algal-dominated communities (Rothenberger et al. 2008).

There are several marine protected areas in St. Croix. Act 6572 created the St. Croix East End Marine Park and authorized the establishment of a territorial system of parks. The St. Croix East End Marine Park was established in 2001, and the management plan developed in 2003. The Ocean Conservancy and The Nature Conservancy (TNC) partnered with USVI Department of Planning and Natural Resources (DPNR) to further the MPA initiative (Rothenberger et al. 2008). MPAs in St. Croix include the St. Croix East End Marine Park, the Federal Sandy Point National Wildlife Refuge, the Federal/Territorial Salt River Bay National Historical Park and Ecological Preserve, and the Federal Buck Island Reef National Monument. There are also fishing closures off Mutton Snapper Reef and Lang Bank managed by the Caribbean Fishery Management Council (CFMC).

Livelihood opportunities for coastal fishermen are somewhat limited, but they sometimes are hired as research assistants by the University of the Virgin Islands, and some work at the Hovensa oil refinery or as taxi drivers. The USVI Division of Fish and Wildlife (DFW) has installed some fish-aggregating devices to shift effort away from reef fish to promote fishing of pelagics, such as tuna and dolphinfish. There is some interest in

²² Additional information provided by Lisamarie Carrubba (NOAA), David Olsen (St. Thomas Fishermen's Association), William Tobias (USVI Department of Planning and Natural Resources), Shona Paterson (University of Massachusetts), Jeanne Brown (The Nature Conservancy).

pursuing a market for pelagics in the southeastern United States. Fishers have been made aware of a low-interest loan program that is available to farmers and fishers.

TNC received a grant from NOAA in 2004 for building capacity related to the St. Croix East End Marine Park (STXEEMP). TNC used this grant to facilitate components of the management plan, such as building opportunities for alternative livelihoods. TNC has initiated two alternative livelihood programs for fishermen in St. Croix. One commercial fisher was trained as an interpretive ranger for the St. Croix East End Marine Park. The process was very lengthy and required a great deal of investment by TNC in the individual. TNC hired the fisher in 2006 to assist in establishing his qualifications for an interpretive ranger position. A great deal of training was required to meet the local government requirement that anyone working in the STXEEMP must hold a minimum of a bachelor's degree. The fisher was finally hired on a two-year contract as an interpretive ranger at STXEEMP in 2008.

In 2006, TNC began a program using a private donation to train fishermen to obtain their commercial captain's license. The first priority for the 12 spots available was for the eight fishermen displaced by the STXEEMP, as the management plan and negotiations for the STXEEMP specifically mentioned alternative livelihoods for these fishermen. There was a low response from the fishermen, so the spots were opened to the wider community. TNC paid for eight fishermen to take the course. The instructor then offered the Master's course at no charge to those fishermen who passed. Only one fisher pursued the Master's course. A staff member was assigned to assisting the trainees throughout the eight-month process of obtaining the license. There were no conditions placed on fishermen in the alternative livelihoods program, as TNC believed the training program was already a burden to the fishermen in terms of forgone fishing hours. The course took place over nine days for four to five hours on weekdays and all day on Saturdays.

For several possible reasons, there was not enough interest from the fishermen to fill the available spots in the program. Some of the displaced fishermen were unable to participate because of literacy and language barriers, and some groups of fishermen belong to marginalized groups, such as Puerto Ricans. Project staff suggested that information and marketing about the program might have been inadequate. In addition, there is some distrust of the NGOs because of past experiences and because the NGO community is very transient.

Overall, attempts by TNC to develop alternative livelihood programs, such as the interpretive ranger program with the STXEEMP and the captain's licensing, did not fully develop as expected. In addition to the reasons given above by project staff, the alternative livelihoods may not have been lucrative enough to compete with fishing. Fishermen benefit from both the income and lifestyle provided by fishing. There may have been limited employment available for those receiving captain's licenses, and TNC was unable to assist the fishermen in finding employment in the new profession. Despite these challenges, at least one fisherman found a job as a commercial captain, and another found employment as a ferry driver. There is no information available regarding specific impacts on the fishermen in the program or ecological impacts on, for example, reef

conditions. Socioeconomic data would also greatly assist in understanding the impacts of the STXEEMP on the fishermen and how alternative livelihoods mediate these impacts.

Rothenberger, P., J. Blondeau, C. Cox, S. Curtis, W. S. Fisher, V. Garrison, Z. Hillis-Starr, C. F. G. Jeffrey, E. Kadison, I. Lundgren, J. Miller, E. Muller, R. Nemeth, S. Paterson, C. Rogers, T. Smith, A. Spitzack, M. Taylor, W. Toller, J. Wright, D. Wusinich-Mendez, and J. Waddell. 2008. The State of Coral Reef Ecosystems of the U. S. Virgin Islands. In: J.E. Waddell and A.M. Clarke (eds.), *The State of Coral Reef Ecosystems of the United States and Pacific Freely Associated States: 2008*. NOAA Technical Memorandum NOS NCCOS 73. NOAA/NCCOS Center for Coastal Monitoring and Assessment's Biogeography Team. Silver Spring, MD. 569 pp.

TNC. 2009.

www.nature.org/wherewework/caribbean/easterncaribbean/wherewework/art8687.html

xi. Waitabu marine reserve ecotourism, Fiji

Waitabu is a small traditional rural village of 30 families and approximately 120 people on the Northeast coast of Taveuni, Fiji's third-largest island. By agreement with the chiefs of surrounding communities, the Waitabu community established the Waitabu Managed Marine Area (MMA) to promote snorkeling for tourists. The MMA covers an a one-kilometer stretch of fringing reef and supports a wide variety of wildlife within the coral reefs of Waitabu fishing ground. To date, 298 species of hard coral and 1,198 species of reef fish have been listed for this MMA. The most common marine organisms are giant clams (*T. squamosa* and *T. derasa*), humphead wrasse (*Cheilinus undulates*), crustaceans and mollusks. Hard and soft coral species include small branching *Montipora* corals, *Porites* boulders, *Acropora* branching coral, and *Sinularia*. The silvertip reef shark is among the more conspicuous species at the MMA. Threats to the area include overfishing, algal blooms due to high nutrient loads in the creek that flows to the area, and an increase since 2006 in crown-of-thorns starfish, which are predators of hard corals.

The MMA program in Waitabu village was initiated to replicate ecotourism activities implemented by the neighboring village of Nakorovou, which centers on the popular Tavoro Falls. People of Nakorovou had shown visitors to this waterfall for many years, averaging 96 tourists a month who paid \$2.00 per person. In 1988, the people of Nakorovou asked the Native Land Trust Board to help them establish a forest park on their land, and the Tavoro Falls Amenity and Recreation Area was opened in April 1991.

Lacking attractions such as the Tavoro Falls, the Waitabu community initiated the MMA. The community agreed to set aside part of their i kanakana (reefs immediately in front of the village) as a MMA to market to the Taveuni tourism industry as a marine ecotourism destination. Upon the request by the villagers in April 1998, a four-day marine-life survey was conducted by Marine Ecology Fiji at the Waitabu village reef. This area was then designated as a no-take zone or tabu. Tourism Resource Consultants (TRC) of New Zealand and Resort Support of Fiji provided advice, and NZAID granted financial support for initial biological surveys and administration (Etzel 2003). Follow-up surveys have been carried out on a yearly basis, with the latest in February 2010.

After two years, the MMA attracted ecotourism based on an excursion designed with the assistance of NZAID, TRC, and Resort Support. This trip involved a half-day visit to the marine reserve, no more than once a week to minimize negative impact on village culture (Sykes & Gow 2004). Today, the Waitabu Marine Park offers two community-guided tours, namely the Cultural Experience Tour and the Backpackers Tour. The former involves a bilibili (traditional raft) ride and a guided snorkeling tour with refreshments, while the latter includes a guided boat trip and guided snorkeling. This tourism business provides small but regular cash income for the community and allows younger people in the village to gain experience working with tourism (Sykes 2006).

A micro-grant from the Coral Reef Alliance (CORAL) enhanced the tourism business by supporting the purchase of new snorkeling gear and equipment to maintain camping areas

(Genthe 2008). In 2003, reef restoration activities were initiated with Resort Support Fiji (Sykes 2004). Also, in 2006, removal of crown-of-thorns starfish was carried out, leading to a decrease in its population in the following year (Reddy and Sykes 2007). Work in Waitabu from 1998 to 2007 was focused on biological surveys and enterprise development. In 2008, work began on environmental awareness and education as well as development of a community management action plan with the Cakaudrove Environment Management Support Team, which is part of the Fiji Locally Managed Marine Areas network (FLMMA).

The Waitabu MMA exists by informal agreement between Waitabu and neighboring villages that share the same *i qoliqoli* or customary fishing rights area (CRFA), and is not recognized formally under government regulations. Initially, the MMA faced some opposition from neighboring villages, but village elders in Waitabu village presented traditional offerings to these villages, asking them for endorsement and support of the initiative. The villages accepted this traditional approach, but biological monitors suspect that some poaching still occurs, based on their survey results. A poaching incident resulted in the death of the village headman in 2007, when suspected poachers' fishing gear was confiscated by villagers and in retaliation a suspect killed the village headman. The community feels that they have fully respected the MMA but suspects that there is still some poaching from outsiders.

Community members manage the Waitabu MMA with support from various partners. Biological surveys at Waitambu are carried out by Marine Ecology Consulting, staff of other FLMMA partner organizations, and the villagers of Waitabu. Marine Ecology Consulting (MEC) was established in 2006 as the technical wing of the established company Resort Support. The initial two surveys and snorkel-guide trainings were supported by NZAID, but subsequent surveys have been carried out without financial support, relying on donated time, accommodation, diving, and travel support from interested parties. CORAL is part of the advisory body of the Waitabu Marine Park Management Committee, provides technical support, and, importantly, facilitates close working relationships between marine recreation providers and the Waitabu community on issues of marine area management and decision-making. CORAL facilitated the development of a successful transparent user-fee system that supports various community initiatives and general management of the marine reserve.

The Waitabu MMA was established to counter the decline in marine stocks observed by the community and also to support tourism by protecting a valuable snorkeling site. Management includes surveillance of the MMA by legally trained honorary fish wardens, the MMA management team, and the local community as a whole. Since the MMA is near the village, surveillance and monitoring of illegal activities by these groups is a continuous activity. There is no formal surveillance workplan.

The major economic incentive derived from the Waitabu MMA program is income from the snorkeling access fee system, the home-stay initiative, and the campsite ecotourism project. The community also earns extra cash from sales of T-shirts, sarongs, handicrafts, and other souvenirs. The snorkeling access fee system provides funds for community

development (e.g., contributions to the community's school and church funds, supporting traditional functions, improving the campsite) and MMA operations. According to Sykes (2010), over the last twelve years of the MMA, the project has earned over FJ\$50,000 for the community. The Waitabu MMA Management Committee handles project income and reports transactions to the Village Council, which comprises everyone who resides in Waitabu village. In the long term, the Committee aims to make its management activities self-sustaining with little or no reliance on external funding sources. To achieve this goal, the Committee and CORAL have developed a five-year Waitabu Marine Reserve Business Plan.

Biological surveys conducted since 1998 provide evidence of increased hard-coral cover and increased abundance of certain fish and invertebrate species inside the MPA. Some species such as *Trochus* snails have not experienced similar increases outside the MPA, but hard coral and many other species have increased just as rapidly (Reddy and Sykes 2007). According to Reddy and Sykes (2007), community members consider the degree of benefits derived from the MPA to be moderate. In terms of social benefits, the awareness- and capacity-building programs have improved the way the community governs its resources. Establishing the Waitabu MMA Committee led to improved participation in planning and decision-making regarding the i qoliqoli. Capacity-building programs over the years have assisted the community in maintaining the MMA program with very limited guidance from partner organizations. Clear and consistent communications with relevant government departments, non-government organizations, and neighboring communities has improved over the years. Full participation of the community in project planning, implementation, evaluation, and decision-making is one of the major strengths in the Waitabu project, leading to a high degree of acceptability and compliance with management actions and resource rules made by the local people. Since local communities are responsible for the development of resource rules in Waitabu, decisions were based on their needs and capabilities, giving them a strong sense of ownership of the project.

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