

RESILIENCE SOURCEBOOK

INSPIRED BY THE 2013 MILSTEIN SCIENCE SYMPOSIUM
UNDERSTANDING SOCIAL AND ECOLOGICAL RESILIENCE IN ISLAND SYSTEMS
INFORMING POLICY AND SHARING LESSONS FOR MANAGEMENT



CASE STUDIES OF SOCIAL-ECOLOGICAL RESILIENCE IN ISLAND SYSTEMS



AMERICAN MUSEUM OF NATURAL HISTORY

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CORAL GARDENS AS A RESPONSE TO THE SUSTAINABILITY CHALLENGE OF CORAL LIME PRODUCTION

ANDRA ISLAND, MANUS, PAPUA NEW GUINEA

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THE SETTING

Andra Island – located at 01°56' S, 147°00' E, off the coast of Manus Island, in the Manus Province of Papua New Guinea – is a small island community with two main clans and about 450 individuals. The island itself is very small – just 0.26 square kilometers, with the surrounding reef and lagoon areas covering about 5.6 square kilometers. The island land area is also shrinking due to recent significant sea-level rise, which has submerged shoreline houses.

Andra is renowned throughout this part of Papua New Guinea for the high quality of the coral lime (calcium hydroxide) that is collected and processed there. Lime is used in the chewing of betel nut, a widespread practice in Papua New Guinea. Betel nut chewers wrap a mixture of the betel nut with lime in either the leaf or flower of *Piper betel* and then chew the whole package. Andra has a traditional monopoly on the production of coral lime within Manus province due to the manner of processing the lime that is a heavily guarded secret. Even women from Andra who marry and live elsewhere are not allowed to practice this way of producing lime off the island. Andra lime producers are also special in that they prefer to only collect the Acroporid, or branching corals, unlike in other places where collectors take all kinds of corals and shells to make coral lime.

Because Andra is a low-lying atoll without much arable land, there is not much agricultural potential beyond small backyard gardens. People fish from the reefs but coral lime is the main source of income for Andra residents. Andra residents obtain the majority of their food by bartering with smoked fish in nearby markets on Manus Island (about a 30-minute canoe ride away), or by selling lime to



Map Data: ©2013 Google

buy food and other essentials in Lorengau, which is about one and a half hours away by boat.

THE DISTURBANCE

With increased desires for commodity goods, and decreasing reef productivity, the pressure on the reef for coral harvesting has augmented beyond the ability of the reef to absorb it. Andra residents today rely on coral collection more heavily than ever for their livelihoods.

Two or three times per year, families work together to collect coral from the reef and then bake the corals after they have dried. Women and children then process the coral lime into bags for sale. Female heads of household go to Lorengau with a bag of lime and stay for three or four weeks, until they sell the whole bag. The mothers then head back to Andra with food and other provisions. Proceeds from one bag can keep a family going for a couple of weeks. Once those supplies are exhausted, they move on to sell the next bag of lime.

The reef cannot keep up with the increased demand – both in terms of fish and coral harvests. This

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creates a vicious cycle – the more Andra islanders rely on coral collection, the more they undermine the reef’s productivity and therefore the level of catch of the most prized fish decreases, which further deepens Andra residents’ specialization in coral collection. People can see changes in their environment, especially the older folks. They talk of when they didn’t have to travel as far out to sea or stay out as long to catch enough fish for a meal. They have seen how the reef structure has changed; the type of fishes that are present now are different in composition and size than in the past and there is more algae now in the waters surrounding the island. People say they have to travel farther to get the same amount of coral, that there is just not enough for everyone. Surveys from 2004 and 2007 showed that coral cover in Andra’s waters was 25% and that biomass of certain fish groups was lower than in neighboring areas. While people have seen that there is a problem with the coral harvesting, this realization is not really translating to a change in the way they harvest coral.

One hopeful observation for the sustainability of coral harvesting in Andra is the fact that the Acroporid corals, the preferred coral for coral lime production, seem to be relatively resilient. A slight increase in Acroporid coral cover between 2004 and 2007 corresponded with a period when fewer people were harvesting live corals. During that time, more young people who had left Andra for jobs in town or other parts of the country were sending money back home to support their families. This modest rebound showed that if the harvesting pressure was relieved, even a little bit, the corals might be able to recover to some degree.

THE RESPONSE

In 2006, the Wildlife Conservation Society (WCS) started the Sustainable Coral Harvesting Project, as a strategy to address the sustainability and livelihood issues for Andra Islanders related to coral lime production. In the beginning, the project focused on practical issues: trying out different types of materials to grow the corals on. For instance, they tried chicken wire at first but it didn’t last for long enough for the coral fragments to establish. Eventually, the project settled on

2-meter-by-1-meter steel frames, which lasted for a couple of years. Using cable ties, project participants attach around ten fifteen-centimeter-long coral fragments. Placed in relatively clear waters so the corals can grow quickly, the brood stock can be transferred to harvest tables after six months. Following this start-up phase, the harvest can be harvested every six months – a harvesting pattern similar in frequency and volume to what Andra residents typically harvest from the reef.

By 2013, the project had successfully established pilot coral gardens owned and managed at the clan level, with ongoing support from WCS. The proceeds from the sales of the cultivated corals were deposited in an account managed by a committee, with the aim of buying more steel and cable ties for more coral tables in the future. This committee was formed by having each clan vote for someone to represent them in this project. Also serving on this committee are a church representative, the headman of the village and the chairman of the village planning committee.

RESULTS

While the project has been successful in that they have developed a method that successfully mimics the average coral harvesting pattern from the reef, an ongoing challenge relates to benefits-distribution and barriers to the establishment of new coral tables. At the moment, most people in Andra see the coral gardens as a training exercise. The project is not yet directly helping the households that rely on the coral lime trade for income. Rewards are going to the clan level and the sub-clan level but are not yet trickling down to the family level. Until WCS can get individual families taking care of coral gardens by themselves, the project is not going to stop people from harvesting directly from the reef. The materials used to establish the coral gardens serve as a barrier for the adoption of the coral gardens at a household. The materials are relatively expensive and difficult to come by – it costs about 200 kina (approximately \$74 USD in 2013) to set up a new coral table, and the materials must be imported. The challenge will be figuring out an alternative strategy for cultivating corals

using locally available materials such as bamboo and locally made twine. If this barrier to adoption can be overcome, then households should be able to begin making their own coral gardens and reaping the benefits themselves in a way that can replace coral collection directly from the reef.

LESSONS LEARNED AND RECOMMENDATIONS

- *Locally available and accessible materials to provide benefit at the right social scale must be prioritized.* While the project has had technical success, the feasibility and impact of the coral gardens cannot be realized without improving accessibility of the materials for coral gardening so that households can capture the benefits. People do not want to have to rely on outside help for their livelihoods.
- *Viable coral gardens are not sufficient.* The real test will be whether or not the coral gardens are changing people's attitudes. Will people be willing to stop harvesting from the reef because of the coral gardens? Behavior change will be the true test of the success of this project.
- *Community consensus is necessary for live coral collection to cease.* Individual families will not stop harvesting from the reefs when others continue to do so. On Andra, everyone struggles to make ends meet and they have to generate enough income to support their families. Stopping coral harvesting from the reef will be a significant livelihood change. If there is to be a change, it has to be supported by everyone on the island.
- *Community leaders must prioritize clear communication with the rest of the community.* It is very important that leaders/representatives continue to maintain a clear line of communication with the people they represent. In terms of project feasibility, it is not possible to always have big community meetings (it is difficult to get everyone together at one time), so representatives are relied upon to communicate about the project on a more day-to-day basis. It

is easy to mislead people or omit details and then the wider community does not understand the purpose of the project. There is a risk that community representatives will work to represent the interests of their family or their clans only rather than that of the whole group they are representing.

LEAD ORGANIZATIONS

- The Wildlife Conservation Society
<http://www.wcs.org>

RESOURCES

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As told to Georgina Cullman.

THE MILSTEIN SCIENCE SYMPOSIUM

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

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