

RESILIENCE SOURCEBOOK

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



CASE STUDIES OF SOCIAL-ECOLOGICAL RESILIENCE IN ISLAND SYSTEMS



AMERICAN MUSEUM OF NATURAL HISTORY

**CENTER FOR BIODIVERSITY
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FACING A COMMON ENEMY IN THE BAY ISLANDS:
RESPONDING TO THE LIONFISH INVASION

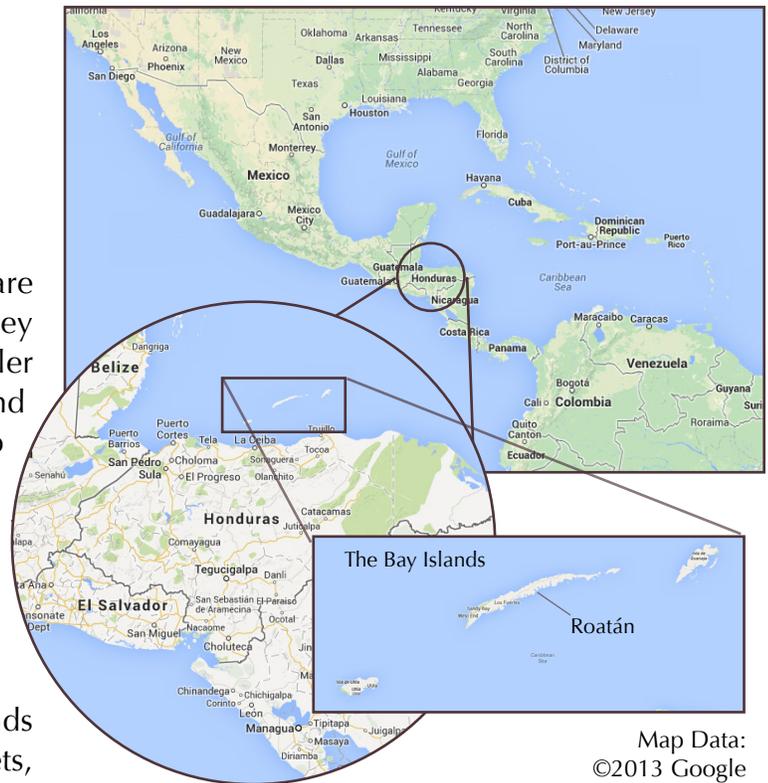
THE BAY ISLANDS, HONDURAS

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THE SETTING

A department of Honduras, the Bay Islands are located about 55 km north off the mainland. They are comprised of three main islands with smaller cays surrounding them. Reef systems surround all of the Bay Islands, ranging from barrier to fringing reefs. This is the eastern-most part of the Mesoamerican Reef, the second largest barrier reef in the world. The largest island, Roatán, considered the capital of the Bay Islands, is located at 16° 23' 0" N and 86° 24' 0" W.

Since the 1950s, the economy of the Bay Islands has been tightly integrated into global markets, although the nature of that engagement has changed over time. In the 1950s-1960s, the lobster (*Nephropidae*), conch (*Strombus gigas*) and shrimp (*Caridea*) fisheries were the mainstay of a booming Bay Islands' economy. Later, in the 1970s, much of the Bay Islands economy came from an influx of diving tourism. Beginning in the 1990s and continuing to the present, large-scale cruise ship tourism became a driving economic force. As tourism increased so did immigration from mainland Honduras to the Bay Islands. This influx of people stressed the natural resources in the area. Today, a diverse population inhabits the Bay Islands. The majority of residents are "Ladinos" – locals from the mainland. Another important group is the Garifuna, an ethnic group with mixed Caribe, Arawak, and West African ancestry, who first arrived on the island around 1790. Also present are mainlanders (Hondurans who immigrate to the islands to find work), residents of European decent (French and English), and foreigners (mostly expats from the US).



Map Data:
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Many NGOs are present on the Bay Islands and take responsibility for reef management. The Honduran Government provides no funding to manage the reef systems of the Bay Islands, so local and international NGOs must seek grants to support reef management.

THE DISTURBANCE

In 2009, lionfish (*Pterois* spp.) were first observed in the Bay Islands. Lionfish have been documented in the Atlantic since the 1990s. It is theorized that the presence of lionfish is due to the aquarium trade and the accidental release of the fish during various hurricanes. Another potential avenue for the fish's introduction from the Pacific was through ballast waters. Managers had little time to plan a response to the invasion. The lionfish first began invading the shallow reefs and within two years they could be found around the whole region.

Managers in the Bay Islands noticed declines in reef fish populations due to the lionfish outbreak.

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Photo credit: Antonio Busiello

One group particularly affected was cleaner fish like the damselfish (e.g., *Stegastes* spp.). Cleaner fish are comprised of many different species but share a common mutualistic behavior – they feed on the dead skin and parasites of other fish. Cleaner fish are particularly vulnerable because they are unaware that the lionfish are predators and approach the lionfish to remove dead skin and parasites. Researchers were also finding larvae of many native species in the guts of lionfish when they were dissected, affecting recruitment for those species. Across the Bay Islands, there was a decline in reef fish biomass – even in areas with fewer resident lionfish.

THE RESPONSE

With the increasing numbers and the pervasiveness of lionfish in the Bay Islands' reefs, managers and local NGOs decided to join forces to find a strategy to eradicate the invasive species. They tried using nets, traps, and a "suction method" in which lionfish were siphoned out of the water with a PVC pipe. Inspired by its success in the eastern Caribbean, managers began to target lionfish by spearfishing. They found spearfishing to be the most effective method to remove the fish.

The Bay Islands NGOs realized they needed to present a united front to successfully petition the Fisheries Department to allow permits for spearfishing the lionfish. It took about one year for the government to grant the request. Both Roatán Marine Park and Bay Islands Conservation Association Utila helped to train divers, such

as staff from local dive shops, to find and spear lionfish on the protected reefs. The training helped to foster better relationships between NGOs in the area because it provided a space where representatives from these NGOs worked together and pursued a means to the same end. Different local and international NGOs began learning from one another and working together.

Funding for the training came from a combination of individual divers paying for training and through a voluntary tax (or user fee) that dive centers agreed to add to their services. Licenses have only been given to dive instructors and dive masters; as a result most of these volunteers are foreigners and are able to pay for the licenses themselves. For about \$35, these volunteers can purchase a license, a spear, and one hour of training. The voluntary tax revenue is put towards eradication of lionfish from the Bay Island reefs as well as patrolling and environmental education.

Local skilled fishers (mainly from the Garifuna



Photo credit: Dano Pendygrass

community) are also being trained to catch (without SCUBA), clean, cook, and market lionfish. In fact, when visiting the area, tourists can find lionfish on the menu in some forty restaurants on Utila and Roatán. Lionfish fillets are also now being sold to mainland grocery stores and delis.

RESULTS

Spearfishing is working to lessen numbers of lionfish. However spearfishing works best if it is in conjunction with effective management. Though it is too early to tell the overall effect of the spearfishing initiative, ongoing assessments of the reefs reveal that there is an increase in biomass of reef fish where lionfish are hunted.

An ongoing challenge of the spearfishing project is the potential abuse of spearfishing licenses. Some local fishermen, who are trained and given licenses, illegally hunt protected reef fish, such as snapper and grouper. Patrol boats have found these protected fish speared in local fishers' boats around the islands.

LESSONS LEARNED AND RECOMMENDATIONS

- Increased collaboration between local, grassroots and international NGOs. The widespread lionfish invasion compelled many local NGOs to come together. This unity allowed each NGO to be able to focus on their strengths and use the strengths of other NGOs to their advantage. This has created better managed marine protected areas (MPAs) and a better stage to push policy.
- The need for a "middle man". International NGOs like the Coral Reef Alliance (CORAL) and the Healthy Reefs Initiative help to create neutral ground in a contentious local NGO environment. The Atlantic and Gulf Rapid Reef Assessment (AGRRA) monitoring training also helped to bring together local NGOs because members of most of the local NGOs



Photo credit: Giacomo Palavicini



Photo credit: Mike Huesner

participated in it and actively contribute to ongoing monitoring efforts.

- Spearfishing only works with concurrent good management practices. Reefs that were found to be more resilient to the lionfish invasion were those reefs that were already adequately managed. For example, areas that had better water quality and higher levels of enforcement had higher populations of grouper (*Epinephelus* sp. and *Mycteroperca* sp.) and other animals that predate lionfish. In areas with higher diversity, unlikely predators might emerge. For example, sharks and eels have been found to prey on lionfish. In fact, sharks can be trained by divers to eat lionfish. In shark sanctuary sites there are fewer and smaller lionfish than in sites with fewer sharks.

- A united front. The NGOs presenting a united front was important to improving the visibility of Bay Islands' conservation issues at national and international levels. Where there were once many separately managed MPAs, there is now one large MPA called the Bay Islands National Marine Park. The Bay Islands National Marine Park is a protected area spanning 6,471.5 square kilometers, zoned for

different levels of protection ranging from no-take zones to multiple use areas. Now the NGOs coordinate their messages and their initiatives. This coordination was helpful in asking the government to grant licenses for spearfishing lionfish. Now that the NGOs are united, their requests are more easily heard.

- Less dependence on grant money. Eighty percent of the enforcement and environmental education projects carried out by the Roatán Marine Park NGO are now funded through voluntary taxes from dive shops and an eco-store that is locally managed. When NGOs are not all vying for the same grant money, it is easier for them to come together. Only twenty percent of program work is through grants.

LEAD ORGANIZATIONS

- Healthy Reefs Initiative
<http://www.healthyreefs.org/cms/>
- Coral Reef Alliance (CORAL)
<http://coral.org>
- Bay Island Conservation Association, Utila Chapter
<http://www.bicautila.org>
- Roatán Marine Park
<http://www.roatanmarinepark.com>
- Utila Center for Marine Ecology
<http://www.utilaecology.org/en/>
- The Atlantic and Gulf Rapid Reef Assessment Program
<http://www.agrra.org>

PARTNERS

- The Ministry of Environment and the Fisheries and Biodiversity Departments of Honduras

As told to Alexandra Donargo.

THE MILSTEIN SCIENCE SYMPOSIUM

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

The 2013 Milstein Science Symposium was proudly sponsored by the Irma and Paul Milstein Family.



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<http://cbc.amnh.org>



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