

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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AND CONSERVATION**

MANAGING COMMUNICATION TO MITIGATE POTENTIAL DAMAGE OF CORAL REEF BLEACHING

TIOMAN ISLAND, MALAYSIA

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THE SETTING

Tioman Island sits about 55 kilometers off the east coast of the Malaysian Peninsula in the South China Sea and is located at 2° 46' N, 104° 10'E. The island is approximately 136 square kilometers, with the highest point on the island a little over 1,000 meters. Tioman is covered in primary and secondary rainforest. There are six villages scattered around the island: five are situated on the west side of the island, sheltered from northeastern monsoons. The population of Tioman Island is over three thousand.

Tioman Island has approximately 14.5 square kilometers of reefs, found mainly on the west coast. The east coast is mainly rocky with abrupt cliff faces that go straight down into the sea. Unlike the west coast, there are not many areas appropriate for reef development – shallow areas with sandy bottoms and low wave intensity.

The Tioman archipelago includes four small islands that lie to the north of the main island. These four islands are very small, just ten to a few hundred meters in length, and are surrounded by reefs with 200-300 different species of corals in the richest areas. Needless to say, dive tourism on Tioman is prevalent. Tioman Island caters to 200,000 tourists each year, the majority of whom are divers or snorkelers.

Malaysia's natural resources are managed at the national level. Natural resource policy, like most of Malaysian policy and law, is top-down. Concerning the reefs, policy decisions are made by the Department of Marine Parks Malaysia, which is overseen by the Ministry of Natural Resources and the Environment. The Department of Marine



Map Data: ©2013 Google

Parks has a director in each state responsible for operations at State level. On Tioman Island, there is a Marine Park Centre with accommodation for a few staff.

The marine protected area surrounding Tioman Island extends for two nautical miles from low-water mark. Visitors to the island pay a conservation charge of five Malaysian Ringgits (in 2013, approximately US \$ 1.56). However, this revenue accrues to a Trust Fund, leaving few resources to manage the Park effectively. The government provides infrastructure such as patrol boats, but operating costs such as fuel costs are often lacking, reducing the effectiveness of patrolling.

There is no local ownership of natural resources. Decisions slowly filter down from the government to the local level, leading to a lack of clarity about national natural resource policy at the local level. The population on Tioman is largely disconnected from the management of their environment. Little effort is made by the community to help manage the Marine Protected Area. For example, when locals see tourists standing on reefs, they may

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complain but do little to prevent it. Few residents understand that trampling damages the reefs. Children commonly know little about the reefs and very few have even observed the reef ecosystem that surrounds them.

Historically fishing had been the mainstay of the communities on Tioman, with little, if any, agriculture on the island. The island had been known for trade and safe passage and the population traditionally traded for rice. In the 1970s, the island developed as a tourism destination. The most popular tourism activities are diving and snorkeling. There are over 60 resorts and 10 dive operations on the island. Non-islander Malaysians mainly own the dive shops. Most resorts are locally owned small-scale chalets with accommodations ranging from “backpacker” to luxurious small boutique resorts. Only one large resort (of international standards) exists on the island. Locals work as resort owners, boat operators, snorkel guides, and in souvenirs and small-scale retail businesses. Only one small village at the south of the island remains a true fishing community.

With the creation of the marine park around Tioman in 1994, fishing and harvesting was banned. There is some local poaching, which is mostly by hook-and-line and does little damage. The majority of people on Tioman buy frozen fish from the mainland.

THE DISTURBANCE

In March of 2010 the National Oceanic and Atmospheric Administration (NOAA) alerted the region to the threat of an imminent bleaching event. Observations by Reef Check Malaysia in May 2010 confirmed significant bleaching. Through surveys, Reef Check found that 90% of the corals in Tioman were bleached. The worst of the bleaching came in June and lasted through August. Temperature of the waters surrounding Tioman island were 3-4°C above normal. Reef Check observed that the bleaching affected other islands off the East Coast of Malaysia and affected the deepest reefs in the region – as deep as 20 meters. By September 2010 the bleaching declined and by October 2010 the

reefs began to recover – to look as they did before the bleaching event.

The bleaching event affected 100% of the reefs. Reef Check Malaysia reviewed its own coral reef survey data between 2010-2011 and 2011-2012. The latter showed a decline in hard coral cover and an increase in recently killed coral, algae-covered coral, and rocky substrate. Reef Check showed with these surveys that, despite the widespread bleaching, only 5% of the corals on Tioman Island died.

THE RESPONSE

Ecological Response

The recovery of the corals from the bleaching event was due in part to its inherent resilience. Interestingly, the patterns they found in the bleaching were abnormal. Boulder corals (*Porites* spp.), which are normally more resistant to bleaching, were the first affected by the bleaching. Less resilient corals like table corals (*Acropora* spp.) bleached later during the bleaching event. An additional atypical observation was of differential bleaching of coral colonies of the same species in the same location – Reef Check observed colonies of the same species of coral, sitting side by side, with only one colony bleached and the others not.



Photo credit: Reef Check Malaysia



Photo credit: Reef Check Malaysia

Community Response

The bleaching event did not affect the Tioman community. In fact, most community members did not know the bleaching event even took place. The temporal scale was very short and though the bleaching affected all of Malaysia, it had very little impact on fish populations.

Institutional Response

Once NOAA alerted the region about the bleaching, the Department of Marine Parks Malaysia established a monitoring program.

In May 2010, the bleaching event came to the public's attention when a dive operator from mainland Malaysia came back from a dive trip off Tioman Island. Having witnessed the bleaching of the corals, he related this to a friend who worked at a local newspaper. With very little scientific or empirical data, the bleaching event was reported in local news media that asserted that the coral reefs around Tioman were all dying because of a bleaching event. Dive site closures were suggested as one possible management option. At this point the news stayed local and dive operators were largely unaffected.

At the same time, Reef Check Malaysia took the initiative to use reef resilience concepts to identify which reef sites would be most suitable for protection in the event site closures were deemed necessary. The goal was also to identify sites that could be closed with minimal disruption to tourism

businesses, mainly dive operators.

Reef Check met with dive operators and explained to them what areas they thought would be more resilient to the bleaching and, therefore, most important to protect by closure. In most cases those same sites were also popular dive sites. Thus, most of these conversations started with Reef Check and the dive operators having opposing interests, with Reef Check saying, "we really need to close this site" followed by the dive operators' response of "no you really can't close this site". Fortunately, with further discussions, including drawing maps of the sites involved, it was found that at most sites, important areas could be closed without having too much impact on business. Reef Check Malaysia understood the dive shops were an important stakeholder and certainly did not want to alienate them. Reef Check approached the majority of dive operators on Tioman and two adjacent islands – Perhentian and Redang. Reef Check aimed to close four critical sites on each island for protection.

However, before the consultation process was completed, in June of 2010, the Department of Marine Parks Malaysia made an effort to mitigate damage done by the bleaching. They announced area closure plans because of the severity of the bleaching. Sites were selected based on the Department's earlier monitoring program.

Unfortunately the news was not communicated



Photo credit: Reef Check Malaysia

clearly, and some subsequent news reports (both local and international) suggested that entire islands were being closed to diving, not just selected reef sites. Fortunately, though some dive operators reported cancellations of bookings, the economic impact was fairly minimal. Lack of enforcement and buy-in by local businesses meant that these closures were largely ineffectual. Because of the poor communication and lack of consultation prior to the closure announcements, most dive shops operators did not support the government-mandated closures and did not consider the closures when taking tourists to the reefs; they brought tourists to the reef areas they wanted, regardless of whether or not the areas were closed by the government.

RESULTS

The 2010 bleaching event and the mistakes in communications that followed became a watershed event for Reef Check Malaysia and helped define their role. Starting in 2011, in response to the lack of management and communication from the government, Reef Check began to put together a bleaching response plan for Malaysia. Their goal was to create a plan to avoid miscommunication in the future. With the concepts of resilience at its core, the final document is essentially a communication document. It proposes the establishment of a Bleaching Response Committee and clearly highlights the steps that need to be taken in the event of future bleaching in the area. For example, on receipt of a “bleaching watch” announcement from NOAA, the Committee will automatically issue pre-prepared emails requesting dive operators to conduct weekly Bleaching Watch surveys. In the event the alert level is increased to “bleaching warning” the Committee will automatically issue invitations to specialists to conduct ground truthing surveys, and if the alert level reaches “bleaching alert level 1” the Committee will automatically issue pre-prepared site closure notices.

At each stage, the document includes pre-written press releases and FAQs for use at different stages of a bleaching event, and a database of relevant contacts, including media, dive operators, and



Photo credit: Reef Check Malaysia

resort operators. The plan aims to make sure that all relevant stakeholders will be consulted and fully aware of what is happening, with the understanding that, if needed, some dive sites would have to be closed.

The Bleaching Response Plan was adopted and published by the Department of Marine Parks Malaysia in 2012.

Reef Check is also using this event to convey the message of the relationship between reef resilience and community resilience. It is important for the community to understand that if the reefs die, marine-based tourism will collapse. There are no terrestrial guides nor are there a network of trails on the island, so land-based tourism cannot fill the economic role for Tioman Island if marine-based tourism fails.

LESSONS LEARNED AND RECOMMENDATIONS

- *Clarity of Communication.* Reef Check Malaysia used a communication response to mitigate the potential damage from a bleaching event. Management can only be effective if stakeholders at all levels know what is going on, where it is happening, and when it will take place. Creating a communication plan will ensure everyone will be up-to-date and informed. This will, hopefully, prevent misinformation and miscommunication that could occur.

- *Consultation, consultation, consultation.* It is important to be in touch with and continuously communicate with businesses that will be impacted by a disturbance. It is also important to educate and consult the community. Even if community members are not directly affected by a disturbance, they can help to mitigate the damage that can come from it. For example, community members can help by avoiding closed areas, not throwing trash into marine areas, or insisting that tourists do not stand on reefs. It is important to keep people involved. It is important that they realize that ultimately they will be affected.
- *Learn about local impacts.* The most common cause of coral bleaching is increase in water temperature, which is associated with global climate change. The global threat cannot be fixed at a local level (while it does have local impact). There is nothing the Tioman community can do to reduce carbon dioxide emissions to prevent coral bleaching due to global warming of ocean waters. Although the cause of the disturbance is not local, the focus must be on local management and threats in order to build resilience. The global nature of this threat means that management of these events becomes just as important as preventing them.

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LEAD ORGANIZATIONS

- Reef Check Malaysia
<http://www.reefcheck.org.my>

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.

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